City of Rancho Palos Verdes
&
City of Rolling Hills Estates

Multijurisdictional Hazard Mitigation Plan

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Prepared under contract with:
Emergency Planning Consultants
San Diego, California

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Credits

Special Thanks

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Acknowledgements

City of Rancho Palos Verdes City Council

- ✓ Anthony M. Misetich, Mayor
- ✓ Brian Campbell, Mayor Pro Tem
- ✓ Susan Brooks, Council Member
- ✓ Jerry Duhovic, Council Member
- ✓ James E. Knight, Council Member

City of Rolling Hills Estates City Council

- ✓ Judy Mitchell, Mayor
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Note: The maps in this plan were provided by the City of Rancho Palos Verdes, City of Rolling Hills Estates, County of Los Angeles, Federal Emergency Management Agency (FEMA), or were acquired from public Internet sources. Care was taken in the creation of the maps contained in this Plan, however they are provided "as is." The Cities cannot accept any responsibility for any errors, omissions or positional accuracy, and therefore, there are no warranties that accompany these products (the maps). Although information from land surveys may have been used in the creation of these products, in no way does this product represent or constitute a land survey. Users are cautioned to field verify information on this product before making any decisions.

FEMA Requirement Citations

In an effort to assist the readers and Cal OES/FEMA reviewers, the jurisdiction has inserted the FEMA requirement citations pertaining to Plan development. Following is an *example* of a FEMA requirement citation:

EXAMPLE

ELEMENT A: PLANNING PROCESS | A1
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))

Table of Contents

Executive Summary

The Multijurisdictional Hazard Mitigation Plan (Plan) was prepared in response to Disaster Mitigation Act of 2000 (DMA 2000). This Plan satisfies mitigation planning requirements for the City of Rancho Palos Verdes and the City of Rolling Hills Estates. DMA 2000 (also known as Public Law 106-390) requires state and local governments to prepare mitigation plans to document their mitigation planning process, and identify hazards, potential losses, mitigation needs, goals, and strategies. This type of planning supplements both Cities comprehensive emergency management programs. This document is a federally mandated update to the 2004 Joint Natural Hazards Mitigation Plan.

Under DMA 2000, each state and local government must have a federally approved mitigation plan to be eligible for hazard mitigation grant funding.

The Disaster Mitigation Act of 2000 (DMA 2000) is intended to facilitate cooperation between state and local governments, prompting them to work together. Through collaboration, mitigation needs can be identified before disasters strike, resulting in faster allocation of resources and more effective risk reduction projects.

The following FEMA definitions are used throughout this Plan:

Hazard Mitigation – "Any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards."

Planning – "The act or process of making or carrying out plans; specifically, the establishment of goals, policies, and procedures for a social or economic unit."
(Source: FEMA, 2002, *Getting Started, Building Support for Mitigation Planning*, FEMA 386-1)

The Plan includes resources and information to assist the Cities of Rancho Palos Verdes and Rolling Hills Estates (RPV/RHE - the "planning area"), their residents, public and private sector organizations, and others interested in participating in planning for natural hazards. The Plan provides a list of activities that may assist the Cities in reducing risk and preventing loss from future natural hazard events. The action items address multi-hazard issues, as well as activities for earthquake, wildfire, earth movement (landslide & debris flow), tsunami, and technological and human-caused hazards.

Mitigation Planning Benefits

Planning ahead helps residents, businesses, and government agencies effectively respond when disasters strike; and keeps public agencies eligible for Hazard Mitigation Grant Program (HMGP) funding. The long-term benefits of mitigation planning include:

- ✓ Greater understanding of hazards faced by a community
- ✓ Use of limited resources on hazards with the greatest effect on a community
- ✓ Financial savings through partnerships for planning and mitigation
- ✓ Reduced long-term impacts and damages to human health and structures, and lower repair costs
- ✓ More sustainable, disaster-resistant communities.

Hazard Land Use Policy in California

Planning for hazards should be an integral element of any city's land use planning program. All California cities and counties have general plans and the implementing ordinances that are required to comply with the statewide land use planning regulations.

The continuing challenge faced by local officials and state government is to keep the network of local plans effective in responding to the changing conditions and needs of California's diverse communities, particularly in light of the very active seismic region in which we live.

Planning for hazards requires a thorough understanding of the various hazards facing the Cities and region as a whole. Additionally, it's important to take an inventory of the structures and contents of various City holdings. These inventories should include the compendium of hazards facing the Cities, the built environment at risk, the personal property that may be damaged by hazard events and most of all, the people who live in the shadow of these hazards.

Support for Hazard Mitigation

All mitigation is local and the primary responsibility for development and implementation of risk reduction strategies and policies lies with each local jurisdiction. Local jurisdictions, however, are not alone. Partners and resources exist at the regional, state and federal levels. Numerous California state agencies have a role in hazards and hazard mitigation.

Some of the key agencies include:

- ✓ California Office of Emergency Services (Cal OES) is responsible for disaster mitigation, preparedness, response, recovery, and the administration of federal funds after a major disaster declaration;
- ✓ Southern California Earthquake Center (SCEC) gathers information about earthquakes, integrates information on earthquake phenomena, and communicates this to end-users and the general public to increase earthquake awareness, reduce economic losses, and save lives.
- ✓ California Department of Forestry and Fire Protection (CAL FIRE) is responsible for all aspects of wildland fire protection on private and state properties, and administers forest practices regulations, including landslide mitigation, on non-federal lands.
- ✓ California Division of Mines and Geology (DMG) is responsible for geologic hazard characterization, public education, and the development of partnerships aimed at reducing risk.
- ✓ California Division of Water Resources (DWR) plans, designs, constructs, operates, and maintains the State Water Project; regulates dams; provides flood protection and assists in emergency management. It also educates the public and serves local water needs by providing technical assistance.
- ✓ FEMA provides hazard mitigation guidance, resource materials, and educational materials to support implementation of the capitalized DMA 2000.
- ✓ United States Census Bureau (USCB) provides demographic data on the populations affected by natural disasters.
- ✓ United States Department of Agriculture (USDA) provides data on matters pertaining to land management.

The RPV/RHE Hazard Mitigation Planning Team (Planning Team) consisting of City and County staff from various departments that worked with Emergency Planning Consultants using the following approach to create the 2013 Multijurisdictional Hazard Mitigation Plan:

- ✓ Identify hazards posing a significant threat
- ✓ Profile these hazards
- ✓ Estimate inventory at risk and potential losses associated with these hazards
- ✓ Develop mitigation strategies and goals that address these hazards
- ✓ Develop plan maintenance procedures for implementation after the joint review by Cal OES and FEMA and FEMA approval.

Although the requirements of DMA 2000 only apply to natural hazards, which are the primary focus of this Plan, the Planning Team felt it was important to also identify profile, assess, and mitigate against technological and human-caused hazards.

As required by DMA 2000, the Cities informed the public about the planning process and provided opportunities for public input. In addition, key agencies and stakeholders shared their expertise during the planning process. This Plan documents the process, outcome, and future of the Cities mitigation planning efforts.

How is the Plan Organized?

The structure of the Plan enables people to use a section of interest to them and allows the Cities of RPV/RHE to review and update sections when new data is available. The ease of incorporating new data into the Plan will result in a Plan that remains current and relevant to RPV/RHE.

Part I: Background

Executive Summary

The Executive Summary provides a very general overview of mitigation planning, the planning process, and the steps involved in implementing the Plan.

Section 1: Introduction

The Introduction describes the background and purpose of developing the Plan for RPV/RHE.

Section 2: Planning Area Profile

The section presents the history, geography, demographics, and socioeconomics of RPV/RHE. It provides valuable information on the demographics and history of the region.

Part II: Hazard Analysis

This section provides information on the process used to assess the demographics and development patterns for the community along with an assessment of the hazards.

Section 3: Risk Assessment

This section provides information on hazard identification, vulnerability and risk associated with natural hazards in the planning area.

Sections 4-8: Hazard-Specific Analysis

Hazard-Specific Analysis on the five hazards posing the greatest threat to the planning area. These hazards occur with some regularity and have been predicted through historic evidence and scientific methods. These hazards include:

Section 4: Earthquake
Section 5: Wildfire
Section 6: Earth Movement
Section 7: Tsunami

Additionally, the Planning Team opted to include a discussion on technological and human-caused hazards, even though these events pose a lesser threat to the planning area.

Section 8: Technological and Human-Caused

Each Hazard-Specific Analysis includes information on the history, hazard causes, hazard characteristics, and hazard assessment.

Part III: Mitigation Strategies

Section 9: Mitigation Strategies

This section highlights the Mitigation Actions Matrix and: 1) past accomplishments; 2) planning approach; 3) goals and objectives; 4) identification, analysis, and implementation of mitigation activities; 5) prioritized mitigation activities; and 6) next steps.

Section 10: Planning Process

This section describes the mitigation planning process including: 1) Planning Team involvement, 2) extended Planning Team support, 3) public and other stakeholder involvement; and 4) integration of existing data and plans.

Section 11: Plan Maintenance

This section provides information on Plan implementation, monitoring and evaluation.

Part IV: Appendix

The Plan appendix is designed to provide users of the Plan with additional information to assist them in understanding the contents of the Plan.

Appendix A: Benefit/Cost Analysis

This section describes FEMA's requirements for benefit cost analysis in hazards mitigation, as well as various approaches for conducting economic analysis of proposed mitigation activities.

Plan Mission

The mission of the Plan is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural, human-caused, and technological hazards. This is achieved by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities to help guide the Cities toward building a safer, more sustainable community.

Mitigation Planning Process

The process for creating the 2013 Plan started with identifying members for the Planning Team. Each team member represented different City departments and specific divisions within those departments with a role in mitigation efforts, the Los Angeles County Fire Department, and the Area G Disaster Management Area Coordinator. The Planning Team met and identified characteristics and consequences of natural and technological and human-caused hazards with significant potential to affect the Cities. The Planning Team utilized the contents from the 2004 Plan to create this 2013 document.

Hazard mitigation strategy and goals were developed by understanding the risk posed by the identified hazards. The group also determined hazard mitigation activities and priorities to include scenarios for both present and future conditions. The final Plan will be implemented through various projects, changes in day-to-day city operations, and through continued hazard mitigation development.

Through a series of Planning Team meetings, Mitigation Action Items identified in the 2004 Plan were reviewed and status information documented.

Public Input

The Plan will be available to the public through different venues and will engage the public, involve them in ongoing planning and evaluation, and facilitate communication. The Planning Team recognizes that community involvement increases the likelihood that hazard mitigation will become a standard consideration in the evolution of both Cities.

The Planning Team will post a public notice on both City websites in advance of submission of the Plan to Cal OES and FEMA and again, prior to each of the City Council public meetings. The resources and information cited in the Plan provide a strong local perspective and help identify strategies and activities to make RPV/RHE more disaster resistant.

Participating Organizations

For mitigation planning to be successful; like all community planning; it requires collaboration with, and support from, federal, state, local, and regional governments; citizens; the private sector; universities; and non-profit organizations. The Planning Team consulted a variety of sources to ensure that the planning process results in practicable actions tailored to local needs and circumstances.

The Planning Area and Hazard Mitigation

Throughout history, the residents of the planning area have dealt with the various natural hazards affecting the area. The earliest inhabitants of the Palos Verdes Peninsula, the Tongva Indians, were careful to locate their villages on high ground for safety from winter floods (source: Fink: Palos Verdes Peninsula: Time and the Terraced Land, 1987).

Although there were far fewer people in the area prior to 1900, the natural hazards adversely affected the lives of those who depended on the land and climate conditions for food and welfare. For example, the drought of 1862-64 devastated local cattle ranching operations on the peninsula (source: Fink, 1987). As the population of the area has continued to increase over time, particularly in the last 50 years, the exposure to natural hazards creates an even higher risk than previously experienced.

Although this Plan only analyzes and provides mitigation for RPV/RHE, this section discusses natural disasters that have affected the entire Palos Verdes Peninsula. Because it is a single geographic landform, natural disasters that have occurred in other parts of the Peninsula in the past have a high likelihood to impact the planning area in the future.

The planning area maintains some of the lowest population densities in Los Angeles County, and offers the benefits of living in a Mediterranean type of climate. The area is characterized by the unique and attractive landscape, magnificent views, and a semi-rural/coastal environment that makes the area so popular. However, the potential impacts of natural hazards associated with the terrain make the environment and population vulnerable to natural disaster situations.

The planning area is vulnerable to significant disruption from earthquakes, wildfires, earth movements, and tsunamis. The Planning Team opted to also include a discussion on technological and human-caused hazards, even though they pose a lesser threat to the planning area. It is difficult to predict when these disasters will occur, or the extent to which they will affect the planning area. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the losses that can result from these natural disasters.

Mitigation Planning

As the cost of damage from natural disasters continues to increase nationwide, the Cities recognize the importance of identifying effective ways to reduce vulnerability to disasters. Natural hazard mitigation plans assist communities in reducing risk from hazards by identifying resources, information, and strategies for risk reduction, while helping to guide and coordinate mitigation activities throughout the Cities.

The Plan provides a set of action items to reduce risk from natural hazards such as education and outreach programs and the development of partnerships. The Plan also provides for the implementation of preventative activities, including programs that restrict and control development in areas subject to damage from natural hazards.

The resources and information within the Plan:

1. Establish a basis for coordination and collaboration among agencies and the public in RPV/RHE.
2. Identify and prioritize future mitigation projects; and
3. Assist in meeting the requirements of federal assistance programs.

The Plan works in conjunction with other City plans, including Multi-Hazard Functional Plans.

Mitigation Plan Jurisdiction and Scope

The Plan affects the areas within the planning area boundaries, with emphasis on City owned facilities and land. This Plan provides a framework for planning for natural and technological and human-caused hazards. The resources and background information in the Plan address existing and future land development throughout RPV/RHE.

Risk Assessment

Risk assessment is the identification of risks posed by a hazard and the corresponding impacts to the community. This process involves five steps: 1) identify hazards, 2) profile hazards, 3) inventory critical assets, 4) assess risks, and 5) assess vulnerability of future development.

Step 1: Identify Hazards

The Planning Team identified the natural hazards that could significantly impact the planning area by referencing their General Plans and the County of Los Angeles All-Hazard Mitigation Plan (Draft 2013).

The Planning Team ranked the hazards based on the probability, magnitude/severity, warning time, and duration.

That analysis yielded the following hazards as posing the greatest risk to the planning area: earthquakes, wildfires, earth movement, and tsunamis.

Step 2: Profile Hazards

Hazard profiles determine the extent to which each hazard could impact the Cities. Each hazard profile contains the following information:

- ✓ Background and local conditions
- ✓ Historic frequency and probability of occurrence
- ✓ Severity
- ✓ Historic losses and impacts
- ✓ Designated hazard areas

Other factors considered include potential impact, onset, frequency, hazard duration, cascading effects, and recovery time for each hazard. Using this information, the Planning Team

assessed the relative risk of each hazard ranging from severe risk to no risk. Where applicable, the source(s) of information, data, and maps showing vulnerable areas and relevant community components are provided.

Step 3: Inventory Critical Assets

Once hazards and profiles were established, locations of critical facilities were plotted and analyzed. To estimate losses from each hazard (number of structures, value of structures and number of people), the Planning Team used local resources; Census data; Hazards U.S. - Multi-Hazard (HAZUS-MH), a Geographic Information System (GIS) risk assessment methodology; and other GIS capabilities including local, regional, and state mapping resources.

The inventory of assets shows a range of resources that could be lost or damaged for each hazard such as population, general building stock (residential and commercial), critical facilities (Police / Fire stations and transportation systems), and utilities.

Step 4: Assess Risks

Estimated losses to structures and their contents, as well as the losses to structure use and function, were identified (as data was available).

Step 5: Vulnerability Analysis of Future Development

This step provides a general description of the planning area facilities and contents in relation to the identified hazards so that mitigation options can be considered in land use planning and future land use decisions. This Plan provides a comprehensive description of the character of the planning area in Section 2: Planning Area Profile. This description includes the geography and environment, population and demographics, land use and development, housing and community development, employment and industry, and transportation and commuting patterns. Analyzing these components helps to identify potential problem areas and serves as a guide for incorporating the goals and ideas contained in this Plan into other community development plans.

Mitigation Goals

The risk assessment and public input involved a review of past mitigation actions, future goals, and appropriate mitigation strategies. The Planning Team identified five mitigation goals that summarize the hazard reduction outcome the Cities want to achieve:

- ✓ Protect Life and Property
- ✓ Enhance Public Awareness
- ✓ Preserve Natural Systems
- ✓ Encourage Partnerships and Implementation
- ✓ Strengthen Emergency Services

These goals guided the development and implementation of specific mitigation activities. Many of the mitigation objectives and action items come from current programs. Emphasis was placed on the effectiveness of the activities with respect to their estimated cost.

Plan Approval

The 2013 Plan was submitted to Cal OES and FEMA for a joint review. FEMA issued a conditional approval on June 13, 2013 pending adoption by the City Councils. On _____ FEMA issued a final approval of the 2013 Plan.

Plan Adoption

The 2004 Joint Natural Hazards Mitigation Plan was originally adopted by the City of Rolling Hills Estates on September 28, 2004 and by the City of Rancho Palos Verdes on October 5, 2004. The 2013 Multijurisdictional Hazard Mitigation Plan is an update to the 2004 Plan. The 2013 Plan was presented to the City of Rancho Palos Verdes City Council for adoption on December 3, 2013 and to the City of Rolling Hills Estates City Council on January 14, 2013. Copies of both City Council resolutions are located in Section 10: Planning Process.

Point of Contact

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Plan Maintenance

Mitigation planning is an ongoing process involving changes as new hazards occur, as the area develops, and as more is learned about hazards and their impacts. The Planning Team will monitor changing conditions, help implement mitigation activities, review the plan semi-annually to determine if City goals are being met, and provide an update to Cal OES and FEMA every five years. In addition, the Planning Team will review After-Action Reports generated after any disaster that impacts the Cities, and revise the Plan, as needed.

Section 1: Introduction

Throughout history, the residents of the planning area have dealt with the various natural hazards affecting the area. The earliest inhabitants of the Palos Verdes Peninsula, the Tongva Indians, were careful to locate their villages on high ground for safety from winter floods (Source: Fink: Palos Verdes Peninsula: Time and the Terraced Land, 1987).

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The planning area is vulnerable to significant threats from earthquakes, wildfires, earth movements, and tsunamis. It is impossible to predict when these disasters will occur, or the extent to which they will affect the planning area. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the losses that can result from these natural disasters.

The City of Rancho Palos Verdes has declared a local emergency on only two occasions, both related to earth movement caused by excessive rains during severe weather. On March 8, 1979, the City of Rancho Palos Verdes declared a local emergency due to severe earth movement resulting from heavy and unusual rains. Rancho Palos Verdes again declared a local emergency on January 17, 1995 due to severe El Nino rainstorms that caused flooding and sliding throughout the community. Rolling Hills Estates most recently declared local emergencies in 2005 and 2010 due to severe weather.

Why Develop a Mitigation Plan?

As the cost of damage from natural disasters continues to increase nationwide, the Cities recognize the importance of identifying effective ways to reduce vulnerability to disasters. Mitigation plans assist communities in reducing risk from hazards by identifying resources, information, and strategies for risk reduction, while helping to guide and coordinate mitigation activities throughout the Cities.

The Plan provides a set of action items to reduce risk from natural hazards such as education and outreach programs and the development of partnerships. The Plan also provides for the

implementation of preventative activities, including programs that restrict and control development in areas subject to damage from natural hazards.

The resources and information within the Plan:

1. Establish a basis for coordination and collaboration among agencies and the public in RPV/RHE.
2. Identify and prioritize future mitigation projects; and
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The Plan works in conjunction with other City plans, including Multi-Hazard Functional Plans.

Mitigation Planning Process

The process for creating the 2013 Plan started with identifying members for the Planning Team. Each team member represented a different City department and specific divisions within those departments with a role in mitigation efforts, the Los Angeles County Fire Department, and the Area G Disaster Management Area Coordinator. The Planning Team met and identified characteristics and consequences of natural hazards with significant potential to affect the Cities. The Planning Team utilized the contents from the 2004 Plan to create this 2013 document.

Hazard mitigation strategy and goals were developed by understanding the risk posed by the identified hazards. The group also determined hazard mitigation activities and priorities to include scenarios for both present and future conditions. The final Plan will be implemented through various projects, changes in day-to-day City operations, and through continued hazard mitigation development.

Through a series of Planning Team meetings, Mitigation Action Items identified in the 2004 Plan were reviewed and status information documented.

Summary of Changes*

Listed below, by section, are the updates and amendments addressed during the plan update process.

Executive Summary

To enhance the Executive Summary, in order to provide further clarification for the reader, the Planning Team:

- ✓ Added two Point of Contacts to provide readers with easy access to the individuals, assigned by the Cities, with the responsibility for facilitating the maintenance of the Plan
- ✓ Added an introduction to the Risk Assessment process
- ✓ Added an introduction to Mitigation Strategies
- ✓ Added an introduction to Plan Adoption
- ✓ Added an introduction to Plan Maintenance

* **ELEMENT D. MITIGATION STRATEGY | D1**
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))

- ✓ Included the FEMA date of approval for the 2004 Plan

Section 1: Introduction

The review and analysis of this section of the Plan identified a need to further expand on the concepts contained within by adding the following topics:

- ✓ Mitigation Planning Process
- ✓ Why Plan for Hazards?
- ✓ Hazard Mitigation Legislation
- ✓ State and Federal Support
- ✓ Hazards U.S. – Multi-Hazard
- ✓ Who Does the Plan Affect?

In addition, the Planning Team updated the Map of Planning Area (Map 1-1).

Section 2: Planning Area Profile

The Planning Team added descriptive information found in the respective cities General Plans. The Planning Team also confirmed the information contained in this section for accuracy and made the following appropriate amendments:

- ✓ Added data sources used to confirm community profile information
- ✓ Updated Population and Demographics data
  - Updated Table 2-1: Planning Area Demographics
- ✓ Updated Housing and Community Development data
  - Added Table 2-2: Housing in the Planning Area
- ✓ Updated Employment and Industry data
  - Added Table 2-3: Planning Area Industry
  - Added Table 2-4: Planning Area Occupation
- ✓ Updated Transportation and Commuting Patterns data

Section 3: Risk Assessment

The Planning Team applied the Calculated Priority Risk Index (CPRI) method to the 2013 Plan in an effort to better compare the hazards identified by the Planning Team as posing a "significant" threat to the community. Utilizing the CPRI, the Planning Team re-confirmed that the natural hazards (Earthquake, Wildfire, Earth Movement, and Tsunami), identified in the 2004 Plan were the most significant threats facing the community. After further analysis, the Planning Team decided to add an additional section to the Updated Plan as listed below:

- ✓ Technological and Human-caused Hazards

The 2013 Plan includes an updated discussion of hazard identification and includes an introduction to FEMA's Calculated Priority Risk Index ranking technique. Additionally, the Planning Team added the following items:

- ✓ Added Table 3-1: Calculated Priority Risk Index

- ✓ Added Table 3-2: Calculated Priority Risk Index for Planning Area
- ✓ Added Table 3-3: Vulnerability: Location, Extent, and Probability for Planning Area for each identified hazard.
- ✓ Updated Table 3-5: Critical Facilities Vulnerable to Hazards
- ✓ Updated Table 3-6: Essential Facilities Vulnerable to Hazards
- ✓ Added Table 3-7 and Table 3-8: Impacts to Existing and Future Types of Structures

Section 4: Earthquake Hazards

The Planning Team updated the historical information by adding earthquake events since the 2004 Plan adoption and included new earthquake studies and findings. Additional topics on *Impacts of Earthquakes in the Planning Area, Severity, Measuring and Describing Earthquakes, and Mercalli Intensity Scale* were added to more specifically define what community members can expect from an earthquake event. Also, the Planning Team:

- ✓ Added a graphic depicting the CPRI rating for earthquake hazards
- ✓ Added Table 4-2: Historical Earthquakes near Los Angeles County
- ✓ Added Map 4-1: Planning Area Fault Map
- ✓ Added Seismic Shaking Intensity Maps
- ✓ Added Planning Area specific HAZUS Maps and Reports
- ✓ Added a list of faults within close proximity to the Planning Area
- ✓ Added an Earthquake Probabilities list showing the location and maximum credible events for each of the known earthquake faults in the region

Section 5: Wildfire Hazards

The Planning Team added historical information on Southern California fires since the 2004 plan and added more descriptions on "Why Wildfires are a Threat to the Planning Area". Topics were added on *Impacts of Wildfires in Planning Area, Severity*, and *Local Conditions* to more specifically define what community members can expect from a wildfire event. In addition, the Planning Team:

- ✓ Added a graphic depicting the CPRI rating for wildfire hazards
- ✓ Updated "Fire Hazard Severity Zone" maps for both cities
- ✓ Added information about 2007 Southern California wildfires
- ✓ Added Table 5-1: 20 Largest California Wildland Fires (By Acreage Burned)
- ✓ Added Table 5-2: 20 Largest California Wildland Fires (By Structures Destroyed)
- ✓ Added Table 5-3: Acreage Burned in Los Angeles County 2004-2010
- ✓ Added Table 5-4: Los Angeles County Wildfire Incidents 2007-2010

Section 6: Earth Movement Hazards

The Planning Team added topics on *Impacts of Landslides in the Planning Area*, *Severity,* and *Local Conditions* to more specifically define what community members can expect from a landslide event. In addition, the Planning Team:

- ✓ Added a graphic depicting the CPRI rating for landslide hazards
- ✓ Added Map 6-1: Planning Area Landslide Hazard Map
- ✓ Added Handout 6-1: Rancho Palos Verdes Public Information Handout – regarding the instability of the San Ramon Canyon

Section 7: Tsunami Hazards

The Planning Team added topics on *Impact of Tsunamis in the Planning Area, Severity* and *Local History of Tsunamis* to more specifically define what community members can expect from a tsunami event. In addition, the Planning Team:

- ✓ Added a graphic depicting the CPRI rating for tsunami hazards
- ✓ Updated Table 7-1: Tsunami Events in California 1930-2012
- ✓ Added Tsunami Inundation Maps 7-1 through 7-3

Section 8: Technological and Human-caused Hazards

The Planning Team decided to include this newly created section for educational purposes. Based on the Risk Assessment conducted by the Planning Team, Technological and Human-Caused Hazards were deemed to pose a "low" threat to the Planning Area. The Planning Team included brief discussions of the following hazards:

- ✓ Hazardous Materials Release
- ✓ Civil Disturbance
- ✓ Terrorism
- ✓ Epidemic/Pandemic
- ✓ Energy Shortage
- ✓ Radiological Accidents
- ✓ Transportation Accidents
- ✓ Water Shortage
- ✓ Natural Gas Pipeline Incidents

Section 9: Mitigation Strategies

The Planning Team reviewed and analyzed this section of the plan and subsequently added, updated or made the following changes:

- ✓ Added the following topics:
  - Overview of Mitigation Strategy
  - Planning Approach
  - Mitigation Measure Categories
- ✓ Added the goals, policies, and projects relating to hazard mitigation from the City of RPV/RHE General Plans.
- ✓ Updated the Mitigation Actions Matrix in the following ways:
  - The action items themselves were updated including appropriate coordinating organization, timeline, and plan goals addressed

- Columns were added for priority ranking (low, medium, and high)
- A column was added for comments pertaining to the status of the action item (New, Revised, Completed, Deleted, and Deferred)
- Extreme care was taken in documenting any changes or other substantive information pertaining to the status of each mitigation action item

✓ Reaffirmed the plan goals and definitions from the 2004 Plan

The Planning Team also made considerable revisions to the topic entitled "How are the Mitigation Action Items Organized?" These revisions included new sources of data including priority ranking and status.

Section 10: Planning Process

The Planning Process was previously contained in the 2004 Plan as *Appendix B: The Public Participation Process*. The Planning Team recognized the importance of public participation and opted to bring that content to the core of the 2013 Plan. In addition, the Planning Team:

✓ Added Table 10-1: Planning Team Timeline and Table 10-2: Planning Team Level of Participation to better define the effort involved in the planning process
✓ Updated the list of meetings that they had been involved in for the 2013 update
✓ Updated the distribution list of the outside agencies that were informed of the availability of the 2013 Plan Update
✓ Updated the attachments including:
  - Public notice for the hearings
  - City Council Resolution
  - Planning Team sign-in sheets

Section 12: Plan Maintenance

The Planning Team reviewed the content of this section and agreed to leave the content as written with the following amendments:

✓ Updated the composition of the list of Planning Team members
✓ Designated the City Managers as having authority to approve updates and amendments to future Mitigation Plans

Why Plan for Hazards?

Hazards impact residents, businesses, property, the environment, and the economy of RPV/RHE. Earthquake, wildfire, earth movement, tsunami, and technological and human-caused hazards have either occurred in the past or have a high potential to expose planning area residents and businesses to the financial and emotional costs of recovering after disasters. The risk associated with hazards increases as more people move to areas affected by these hazards.

Even in those communities that are essentially "built-out" (i.e., have little or no vacant land remaining for development), population density continues to increase when existing lower

density residential and non-residential development is replaced with medium and high density residential development projects.

The inevitability of hazards, and the growing population and activity within the area create an urgent need to develop strategies, coordinate resources, and increase public awareness to reduce risk and prevent loss from future hazard events. Identifying the risks posed by hazards, and developing strategies to reduce the impact of a hazard event can assist in protecting life and property of citizens and communities. Local residents and businesses can work together with the Cities to create a mitigation plan that addresses the potential impacts of hazardous events.

Hazard Mitigation Legislation

Relevant hazard mitigation legislation and grants are highlighted below.

Hazard Mitigation Grant Program

In 1974, Congress enacted the Robert T. Stafford Disaster Relief and Emergency Act, commonly referred to as the Stafford Act. In 1988, Congress established the Hazard Mitigation Grant Program (HMGP) via Section 404 of the Stafford Act. Regulations regarding HMGP implementation based on the DMA 2000 were initially changed by an Interim Final Rule (44 CFR Part 206, Subpart N) published in the Federal Register on February 26, 2002. A second Interim Final Rule was issued on October 1, 2002.

The HMGP helps states and local governments implement long-term hazard mitigation measures for natural hazards by providing federal funding following a federal disaster declaration. Eligible applicants include state and local agencies, Indian tribes or other tribal organizations, and certain nonprofit organizations.

In California, the HMGP is administered by Cal OES. Examples of typical HMGP projects include:

- ✓ Property acquisition and building relocation
- ✓ Structural retrofitting to minimize damages from earthquake, flood, high wind, wildfire, or other natural hazards
- ✓ Elevation of flood-prone structures
- ✓ Vegetative management programs, such as:
    - Brush control and maintenance
    - Fuel break lines in shrubbery
    - Fire-resistant vegetation in potential wildland fire areas

Pre-Disaster Mitigation Program

The Pre-Disaster Mitigation Program (PDM) was authorized by §203 of the Stafford Act, 42 United States Code (USC), as amended by §102 of the DMA 2000. Funding is provided through the National Pre-Disaster Mitigation Fund to help state and local governments (including Indian tribal governments) implement cost-effective hazard mitigation activities that complement a comprehensive mitigation program.

In Fiscal Year 2011, two types of grants (planning and competitive) were offered under the PDM Program. Planning grants allocate funds to each state for mitigation plan development. Competitive grants distribute funds to states, local governments, and federally recognized Indian tribal governments via a competitive application process. FEMA reviews and ranks the submittals based on pre-determined criteria. The minimum eligibility requirements for competitive grants include participation in good standing in the National Flood Insurance Program (NFIP) and a FEMA-approved Mitigation Plan.
(Source: http://www.fema.gov/fima/pdm.shtm)

Flood Mitigation Assistance Program

The Flood Mitigation Assistance (FMA) Program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101). Financial support is provided through the National Flood Insurance Fund to help states and communities implement measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP.

Three types of grants are available under FMA: planning, project, and technical assistance. Planning grants are available to states and communities to prepare flood mitigation plans. NFIP-participating communities with approved flood mitigation plans can apply for project grants to implement measures to reduce flood losses. Technical assistance grants in the amount of 10 percent of the project grant are available to the state for program administration. Communities that receive planning and/or project grants must participate in the NFIP. Examples of eligible projects include elevation, acquisition, and relocation of NFIP-insured structures. (Source: http://www.fema.gov/fima/fma.shtm)

Disaster Mitigation Act of 2000

DMA 2000 (DMA 2000) was signed by President Clinton on October 30, 2000 (Public Law 106-390). Section 322 primarily deals with the development of mitigation plans. The Interim Final Rule for planning provisions (44 CFR Part 201) was published in the Federal Register twice: February 26, 2002 and October 1, 2002. The mitigation planning requirements are implemented via 44 CFR Part 201.6.

DMA 2000 was designed to establish a national program for pre-disaster mitigation, streamline disaster relief at the federal and state levels, and control federal disaster assistance costs. Congress believed these requirements would produce the following benefits:

- ✓ Reduce loss of life and property, human suffering, economic disruption, and disaster costs.
- ✓ Prioritize hazard mitigation at the local level with increased emphasis on planning and public involvement, assessing risks, implementing loss reduction measures, and ensuring critical facilities/services survive a disaster.
- ✓ Promote education and economic incentives to form community-based partnerships and leverage non-federal resources to commit to and implement long-term hazard mitigation activities.

Under DMA 2000 state and local government (each city, county, and special district), and tribal government must develop a Mitigation Plan to be eligible to receive HMGP funds. Every mitigation plan, which must be reviewed by the state and approved by FEMA, should address the following items:

- ✓ Plan Promulgation
- ✓ Planning Process including Public Involvement
- ✓ Hazard Identification and Risk Assessment
- ✓ Mitigation Strategy
- ✓ Plan Implementation and Maintenance Procedures

State and Federal Support

While local jurisdictions have primary responsibility for developing and implementing hazard mitigation strategies, they are not alone. Various state and federal partners and resources can help local agencies with mitigation planning.

Cal OES is the lead agency for mitigation planning support to local governments. In addition, FEMA offers grants, tools, and training.

The Plan was prepared in accordance with the following regulations and guidance:

- ✓ DMA 2000 (Public Law 106-390, October 10, 2000)
- ✓ 44 CFR Parts 201 and 206, Mitigation Planning and Hazard Mitigation Grant Program, Interim Final Rule, October 1, 2002
- ✓ 44 CFR Parts 201 and 206, Mitigation Planning and Hazard Mitigation Grant Program, Interim Final Rule, February 26, 2002
- ✓ How-To Guide for Using HAZUS-MH for Risk Assessment, (FEMA 433), February 2004
- ✓ Mitigation Planning "How-to" Series (FEMA 386-1 through 9 available at: http://www.fema.gov/fima/planhowto.shtm)
- ✓ Getting Started: Building Support For Mitigation Planning (FEMA 386-1)
- ✓ Understanding Your Risks: Identifying Hazards and Estimating Losses (FEMA 386-2)
- ✓ Developing the Mitigation Plan: Identifying Mitigation Actions and Implementing Strategies (FEMA 386-3)
- ✓ Bringing the Plan to Life: Implementing the Mitigation Plan (FEMA 386-4)
- ✓ Using Benefit-Cost Review in Mitigation Planning (FEMA 386-5)
- ✓ Integrating Historic Property and Cultural Resource Considerations into Mitigation Planning (FEMA 386-6)
- ✓ Integrating Manmade Hazards Into Mitigation Planning (FEMA 386-7)
- ✓ Multi-Jurisdictional Mitigation Planning (FEMA 386-8)
- ✓ Using the Mitigation Plan to Prepare Successful Mitigation Projects (FEMA 386-9)
- ✓ State and Local Plan Interim Criteria Under the DMA 2000, July 11, 2002, FEMA
- ✓ Mitigation Planning Workshop For Local Governments-Instructor Guide, July 2002, FEMA
- ✓ Report on Costs and Benefits of Natural Hazard Mitigation, Document #294, FEMA

- ✓ LHMP Development Guide – Appendix A - Resource, Document, and Tool List for Local Mitigation Planning, December 2, 2003, Cal OES

Hazards U.S. – Multi-Hazard

In 1997, FEMA developed a standardized model for estimating losses caused by an earthquake. Hazards U.S. (HAZUS) addressed the need for more effective national, state, and local planning and the need to identify areas that face the highest risk and potential for loss.

HAZUS-MH uses Geographic Information System technology to produce detailed maps and analytical reports on physical damage to building stock, critical facilities, transportation systems, and utilities.

Hazards U.S. Multi-Hazard (HAZUS-MH) provides models to estimate potential losses from floods (coastal and riverine) and winds (hail, hurricane, tornado, tropical cyclone, and thunderstorm). HAZUS-MH applies engineering and scientific risk calculations developed by hazard and information technology experts to provide defensible damage and loss estimates. This methodology provides a consistent framework for assessing risk across a variety of hazards.

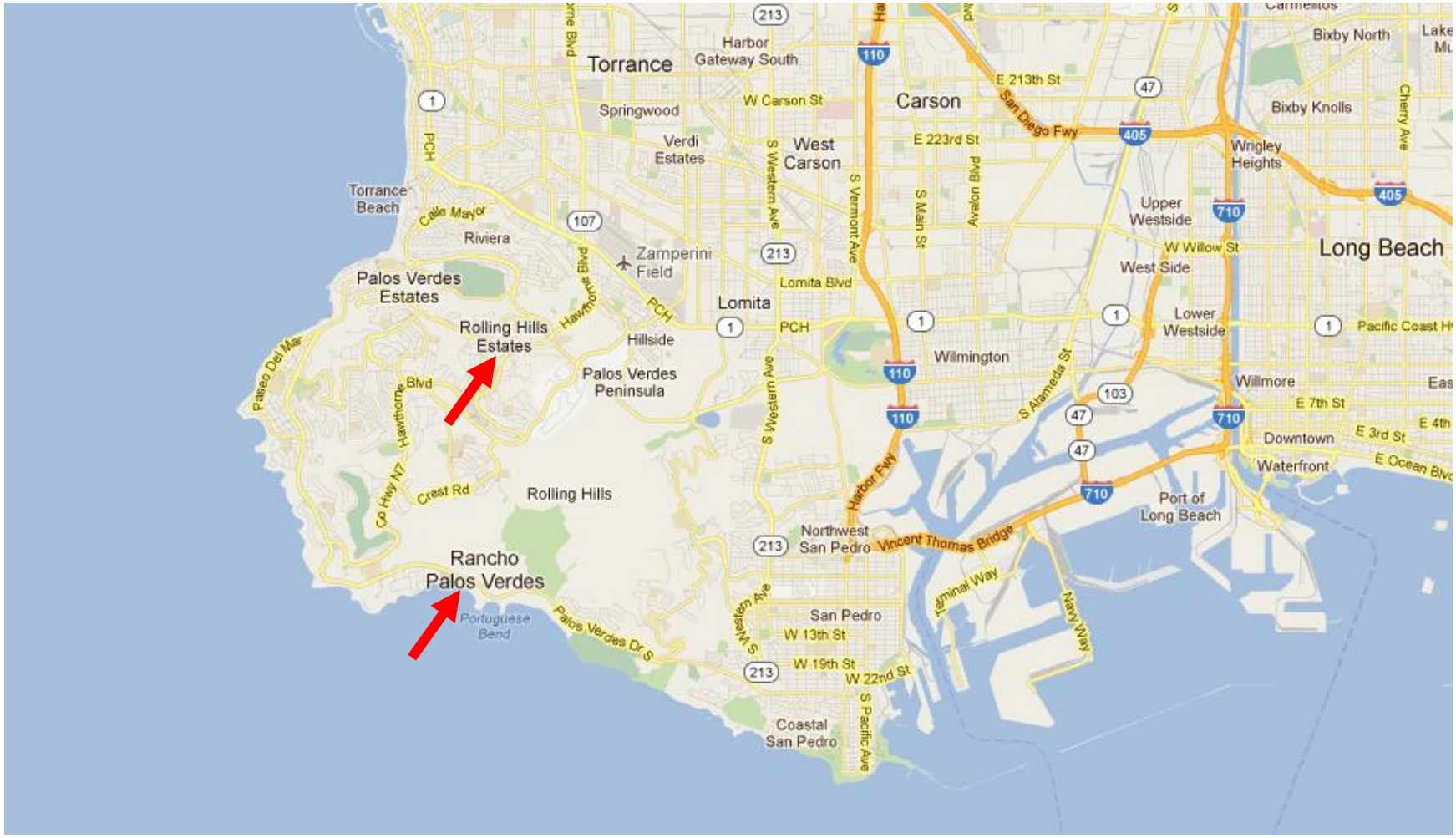
HAZUS-MH uses Geographic Information System technology to produce detailed maps and analytical reports on physical damage to building stock, critical facilities, transportation systems, and utilities. The damage reports cover induced damage (debris, fire, hazardous material, and inundation) and direct economic and social losses (casualties, shelter requirements, and economic impacts), promoting standardization.

HAZUS maps created by the County of Los Angeles are included in the Hazard-Specific Sections.

Who Does the Plan Affect?

The Plan affects the entire planning area. This Plan provides a framework for planning for hazards. The resources and background information in the plan is applicable area-wide, and the goals and recommendations can lay groundwork for other local mitigation plans and partnerships. Map 1-1 shows the regional proximity of RPV/RHE to their adjoining communities.

Map 1-1: Map of Planning Area – RPV/RHE
(Source: Google Maps)



Section 2: Planning Area Profile

Geography and the Environment

The planning area is located on the Palos Verdes Peninsula, approximately 20 miles south of Central Los Angeles. The total size of the planning area is 17.78 square miles. The City of Rancho Palos Verdes has an area of 13.6 square miles, while the City of Rolling Hills Estates has a smaller area of 4.18 square miles.

The Palos Verdes Peninsula has a unique physiography, formed over millions of years of submerging and lifting from the Pacific Ocean. Once an island, the Peninsula is nine miles wide by four miles deep, now rises above the Los Angeles Basin, with the highest elevation at 1480 feet. The terrain of much of the planning area is rolling hills, steep slopes, canyons and coastal bluffs.

The planning area is bounded on the north by Torrance, Rolling Hills, and Palos Verdes Estates; on the south and west by the Pacific Ocean; and on the east by Lomita and San Pedro (Los Angeles).

History

The earliest human inhabitants of the Palos Verdes Peninsula were the tribes of Tongva Indians who were first described by the Spanish explorer Cabrillo in 1542. The area was taken under Spanish rule by the armies under Cortez and remained so, virtually undisturbed, until Mexico won its independence from Spain in 1822. In 1827, the Governor of Mexican California rewarded Don Jose Dolores Sepulveda for his military service by giving him a land grant of the "Rancho de los Palos Verdes (Ranch of the Green Trees)." The Sepulveda family operating a flourishing cattle ranch on the land until the great drought of 1862-64 decimated the herds and boundary litigation resulted in the great rancho being awarded to Jotham Bixby in 1882.

In addition to improving the cattle herds, Bixby's ranch manager, Harry Phillips introduced farming to the Palos Verdes Peninsula in the early 1900's. He leased land to Japanese farmers on the south slope of the Peninsula to cultivate vegetables, while Caucasian families principally grew grains on the drier northern slopes. In 1913, a group of New York investors purchased most of the peninsula intending to develop a community of large estates for the wealthy. It was not until 1921, however, that Frank A. Vanderlip, Sr., one of the New York investors, and E.G. Lewis, a real estate promoter, founded the Palos Verdes Project and the first houses first appeared on the hillsides in 1924.

Although the rate of development was slow through the decades of the Great Depression and World War II, the economic and population boom that occurred in the post-war years precipitated the most rapid period of growth on the Palos Verdes Peninsula during the 1950's and 1960's. The pace of development has been much slower over the last three decades, with the majority of the remaining open tracts of land either being developed for low-density residential projects or preserved as permanent open space. (Source: Palos Verdes Peninsula: Time and the Terraced Land by Augusta Fink, Western Tanager Press, 1987) Rolling Hills Estates was incorporated in 1957 in order to preserve and protect a rural community atmosphere. Rancho Palos Verdes was incorporated in 1973 in order to gain control over the increasing number of high-density residential projects being approved by the County and to return to predominately single-family residential development pattern in the community.

Climate

The planning area has one of the most ideal climates of the world. Its average maximum and minimum temperatures range approximately between 67-68°F. and 50-54°F.and the average annual precipitation is approximately 13 inches.

The sea breeze, which is the predominant wind, is a primary factor in creating this climate and typically flows from the west-southwest in a day-night cycle with speeds generally ranging from 5 to 15 mph. The sea breeze maintains the cool temperatures and clean air circulation and generally prevents warmer inland temperatures and air pollution from permeating into the peninsula, except under certain seasonal conditions such as the offshore Santa Ana winds.

Minerals and Soils

The characteristics of the geology and soils present in the planning area indicate that potential types of hazards that may occur. Due to the Palos Verdes Peninsula's rugged topography, the weak layers exist within the folded sedimentary rock that chiefly underlies the area, and fact that the peninsula is bounded by two sub parallel earthquake faults, the planning area is prone to geologic hazards, such as landslides, earthquakes and liquefaction.

The oldest rocks on the peninsula date to the Jurassic period, a geologic age some 150 million years ago. These rocks are Catalina schist, a metamorphic rock created under great heat and pressure, which form the "basement rock" layer on which all of the peninsula's sedimentary rocks are overlain. During the Miocene period, geologists estimate that the Palos Verdes Peninsula was above and below sea waters a total of three times. While the Palos Verdes Peninsula was under water, sedimentary layers were deposited on the sea floor from the erosion of the higher mountains surrounding en the Los Angeles Basin. The last emergence of the peninsula started 30,000 years age and occurred in intervals, perhaps 1,000 years apart. Each uplift exposed more land, with a new shoreline being exposed to erosion by ocean waves. A total of thirteen such eroded terraces have been documented, although only five are clearly discernible today. Sediments on the Palos Verdes Peninsula are mostly Monterey Shale, a crumbly brown rock locally designated as Altamira Shale, Valmonte Diatomite and Malaga Mudstone (from oldest to youngest). (Source: Handbook of Wildflowers, Weeds, Wildlife and Weather of the South Bay and Palos Verdes Peninsula by Donald Moore Gales, Foldaroll Company, 1988)

Areas within Rancho Palos Verdes also have intrusions of basalt from volcanic activity sending lava through the sedimentary layers to the surface, where it hardened. Some inland areas contain layers of tuff, which is volcanic ash that has turned into rock. Other earth materials on the peninsula include sandstone shales between limestone layers, the latter creating the beautiful white Palos Verdes stone often used locally as landscaping accents and decorative masonry. In addition to Palos Verdes stone, from the late 1940's to the late 1950's, several types of minerals were extracted at various locations within the planning area through commercial quarrying operations, including sand, basalt, and diatomaceous earth. Due to high land values favoring residential development, there are no current commercial mining operations within the planning area. (Source: Gales, 1988)

The top layer of earth in most ungraded areas is heavy, black adobe clay resulting from weathering of rock debris and other materials. In graded areas, imported topsoil has generally

been added over the exposed sterile diatomite and Altamira shale subsoils to support ornamental landscaping associated with development. (Source: Gales, 1988)

Population and Demographics

The planning area has a total population of about 49,710 (RPV 41,643 and RHE 8,067). The planning area includes an area of approximately 17.78 square miles (RPV 13.6 square miles and RHE 4.18 square miles). The population of the planning area has increased by 1.8% (adding 889 residents) since the 2000 U.S. Census. (Source: 2000/2010 U.S. Census)

According to the City's General Plan, Rolling Hills Estates is almost fully urbanized with lower density residential neighborhoods and scattered concentrations of commercial land uses. Vacant parcels are mostly steep slope areas and canyons. A network of equestrian trails and other equestrian facilities provide a major recreational resource for residents. Growth in the City has been very slow, with the limited increase in single-family dwelling units accompanied by a decrease in household sizes.

The Rancho Palos Verdes General Plan states that the City is almost entirely built-out with predominately single-family residential development with scattered concentrations of multi-family residential and commercial development. The remaining vacant parcels are mostly steep slopes, canyons and areas impacted by land movement. Several active park sites and an extensive amount of preserved natural open space and passive parkland, particularly along the City's coastline, provide the majority of recreational resources for residents. Since the City's incorporation, growth has proceeded at a slow pace.

The semi-rural character of the planning area creates more community exposure, and changes how agencies prepare for and respond to natural hazards. For example, more people living on the urban fringe face an increased risk of fire hazard. Wildfire has an increased chance of starting due to human activities in the urban/rural interface, and has the potential to injure more people and cause more property damage. But an urban/wildland fire is not the only exposure to the planning area.

According to the 2010 Census figures, the demographic makeup of the Cities is as follows:

Table 2-1: Planning Area Demographics (Source: 2010 U.S. Census)

Racial/Ethnic Group	Rancho Palos Verdes (Population %)	Rolling Hills Estates (Population %)
White Non-Hispanic	61.7 %	67.7%
Hispanic	8.5%	6.2%
Asian	29.0%	24.9%
African American	2.4%	1.4%
Native American	0.2%	0.2%
Other	1.9%	1.6%

The 2010 Census showed that of the population over 5 years old that speaks English less than "very well" is 33.4% in RPV and 10.6% in RHE. This factor, in combination with an unknown

portion of the planning area's daytime populations that may not be proficient in the English language, poses a challenge in planning for and mitigating disasters. The ethnic and cultural diversity suggests a need to address multi-cultural needs and services.

Although the Cities do not have data on the number of disabled residents living in the planning area, the 2010 Census indicated that the population over 65 years in age is 23.2% in RPV and 23.1% in RHE, which is higher than the state's average of 11.4%

The percentage of poverty in RPV is 3.8% and RHE is 1.7%, both are considerably less than the state's average of 15.8%.

Vulnerable populations, including seniors, disabled citizens, women, and children, as well as those people living in poverty, may be disproportionately impacted by hazards.

Examining the reach of hazard mitigation policies to special needs populations may assist in increasing access to services and programs. FEMA's Office of Equal Rights addresses this need by suggesting that agencies and organizations planning for natural disasters identify special needs populations, make recovery centers more accessible, and review practices and procedures to remedy any discrimination in relief application or assistance.

The cost of hazard recovery can place an unequal financial responsibility on the general population when only a small proportion may benefit from governmental funds used to rebuild private structures. Discussions about hazards that include local citizen groups, insurance companies, and other public and private sector organizations can help ensure that all members of the population are a part of the decision-making processes.

Housing and Community Development

Following is a distribution of the development and housing types in the planning area.

Since the adoption of the previously-approved plan, some development in the Cities of Rancho Palos Verdes and Rolling Hills Estates has occurred due to an upturn in the local economy.

Development in the City of Rancho Palos Verdes
The City of Rancho Palos Verdes lists on its website (http://www.palosverdes.com/rpv/planning/planning-zoning/index.cfm) major development projects in various stages. These are identified below.

Major Development Projects Under Operation

- Mirandela, a 34-unit Senior Affordable Housing project, is located at the northwest corner of Crestridge Road and Crenshaw Boulevard.
- Terranea Resort and Spa, which opened in June 2009, has hotel room accommodations, banquet and conference facilities, restaurants, spa and fitness center, and a 9-hole golf course. Additional public amenities include two free public parking lots, public trails overlooks, a sandy beach, public snack shop, public restrooms, drinking fountains, interpretive signs along the public trails, bicycle racks, picnic tables, benches, and viewing stations.
- The Trump National Golf Club development consists of an 18-hole public golf course, a driving range, a clubhouse, a maintenance facility, 4 affordable housing units, 59 single

family residential lots, public parklands, pedestrian and bicycle trails, and native habitat preserves.

Major Development Projects Under Construction

- Oceanfront Estates Residential Tract is a 79-home single-family subdivision located on the seaward side of Palos Verdes Drive West at the southerly terminus of Hawthorne Boulevard. The 132-acre site is bordered by the Lunada Pointe neighborhood to the north and the City's Point Vicente Interpretive Center to the south. When completed, Oceanfront will include 79 single-family homes on 20,000 to 30,000 square foot lots. A total of 71 acres of the site has been dedicated to the City as open space, including at least 30 acres of coastal sage scrub habitat. The project provides a loop road along the bluff, a 25-space parking lot and pedestrian and bicycle trails.
- The St. John Fisher property is located at 5448 Crest Road, on the southeast corner of the intersection at Crest Road and Crenshaw Boulevard. The property is currently developed with an elementary school (K-8), administrative/parish offices, recreational hall (Barrett Hall), rectory (priest's residence), convent (no longer in use) and sanctuary. The approved project includes a major remodel and expansion of the existing facilities, as well as new construction such as a sanctuary, administration building, additional classrooms, library, storage, garage, and additional offices.

Proposed Major Development Projects

- The Civic Center Master Plan includes the development of a fully-functioning civic center with a village green, city hall with council chambers, community center, cultural center, parking lot, and trailheads at the Upper Point Vicente Park.
- The Crestridge Senior Housing/Senior Center project would involve the development of a senior-restricted (55+ years of age or older) for-sale residential community with supportive service program. The proposed project would include 60 attached residential units at an overall density of 6.15 units per acre.
- Marymount College Facilities Expansion Project includes residence halls, athletic facility, library, maintenance building, art studio, faculty/academic building, bookstore/faculty dining addition, admission office addition, parking lot reconfiguration/reconstruction, relocation of athletic fields, and demolition.
- Point View Agriculture, Golf Course, and Event Garden Master Plan project includes orchards for avocados, citrus, and vineyards; a 9-hole executive golf course, and an event garden.
- Zone 2 Landslide Moratorium Ordinance Revisions created a new exception category in the City's Landslide Moratorium Ordinance to allow development of undeveloped lots in Zone 2 of the City's Landslide Moratorium Area, in response to the California State Court of Appeal's decisions in the case of Monks v. Ranchos Palos Verdes that prohibition of development in Zone 2 was a taking and an impermissible impediment to development of the plaintiffs' lots. With this resulting decision, there is potential for the development of 47 lots in this area that is susceptible to landslides.

Approved Major Development Projects That Have Not Begun Construction

- Highridge Condominiums project includes the development of a 28-unit residential condominium complex with 67 off-street parking spaces.
- Nantasket Drive Residential project includes four residential lots for single-family residential development.

Other planning projects/topics in the City of Rancho Palos Verdes include:

- Abalone Cove Shoreline Park Improvement Project

- California Coastal Trail RPV Segment
- Evaluation of the Portuguese Bend Landslide and Moratorium Ordinance in which the City Geologist has opined that the City should continue to prohibit construction on vacant lots within the entire landslide moratorium area and establish a cumulative maximum of 1,200 square feet of additions to existing homes in the landslide moratorium area.
- Palos Verdes Nature Reserve
- Forrestal Nature Preserve
- Trails Master Plan
- Western Avenue Vision Plan

In addition, the City is undergoing a General Plan Update, including an update to its Housing Element which will likely include anticipated housing development to address Regional Housing Needs. Additionally, the General Plan Update includes a review of "Hazard" areas. The Planning Commission has agreed to move forward with adjusting the Hazard boundary lines as recommended by the City Geologist for only those properties where the Hazard land use area decreases and change the zoning designation for hillside areas to "Open-Space Hillside."

As evidenced above, the City continues to experience development pressures within its boundaries. All the development described above, as well as any in the near future, will continue to increase the City's vulnerability to potential hazards, including earthquake, wildfire, earth movement, and tsunami. Building codes, site and development review requirements, and other mechanisms are in place to address potential hazards and their effect on the built environment. However, additional mitigation-oriented activities and efforts can make the City more resilient to the impacts of the identified hazards.

Development in the City of Rolling Hills Estates

Projects in the City of Rolling Hills Estates that are completed, planned, or proposed, based on the City's website (http://www.ci.rolling-hills-estates.ca.us/index.aspx?page=129), are identified below.

- The proposed 655-683 Deep Valley Drive and 924-950 Indian Peak Road Mixed-Use Residential Project is located in the southwestern portion of the City within the City's main commercial area. The proposed project would demolish the existing office buildings at 655 Deep Valley Drive, 924 and 950 Indian Peak Road, surface parking lots, and landscaping. Construction of the proposed project would stabilize the existing landslide and include 148 residential units, approximately 14,200 square feet (sf) of commercial area fronting Deep Valley Drive, and associated parking. In addition, the project would remove 2,013 square feet of commercial space and add 63 off-street parking spaces, for a total of 137 parking spaces at the Brick Walk commercial development.
- The Chandler Ranch Subdivision/Rolling Hills Country Club project includes 114 new single family homes, a reconfigured 18-hole golf course, and a new approximately 61,000 square foot clubhouse and related facilities. The 228-acre project site is located on the existing sites of the Chandler Quarry and Rolling Hills Country Club (26311 and 27000 Palos Verdes Drive East) in the northeasterly portion of the City of Rolling Hills Estates.
- The proposed project consists of building a new one-story 4,404 square foot freestanding Chase Bank branch with a drive-thru ATM and 31 stalls, at 828 Silver Spur Road.

- The Palos Verdes Drive Bike Lane Project includes the creation of 1.3 miles of bike lanes along Palos Verdes Drive North between Crenshaw Boulevard and the West City Limits. As well as providing five-foot (5') wide on-street striped bike lanes in both directions along this stretch of Palos Verdes Drive North, the project also includes intersection enhancements at Palos Verdes Drive North and Silver Spur Road, Palos Verdes Drive North at Hawthorne Boulevard and Palos Verdes Drive North at Crenshaw Boulevard; new merge lanes to improve traffic safety and reduce traffic congestion; a complete street resurfacing to address the current structural conditions of the roadway; the addition of rolled curbs to improve drainage and keep traffic from the unimproved shoulder; raised median islands to promote traffic calming; and new crosswalk warning systems for school children and equestrians.

Along with existing development, these projects in Rolling Hills Estates will increase the City's vulnerability to earthquake and wildfire hazards. Although not necessarily located in areas susceptible to earth movement hazards, these projects are located in proximity to highly susceptible hazard areas and can be severely impacted during a disaster event. Additionally, future development may be planned for areas located in identified high hazards areas. Building codes and site and development review processes are in place to address potential hazards and their effect on the built environment. Additional mitigation-oriented activities and efforts can make the City more resilient to the impacts of the identified hazards.

Table 2-2: Housing in the Planning Area (Source: 2010 Census)

	RPV	RHE
Housing Type:		
Single-Family	78.6%	74.9%
Multi-Residential (20+ units)	9.5%	0.8%
Mobile homes	0.1%	1.2%
Housing Statistics:		
Total Available Housing Units	16,003	2,950
Owner-Occupied Housing	83.0%	91.0%
Average Household Size	2.72	2.78

Employment and Industry

The following table indicates the employment and industry statistics for the planning area.

Table 2-3: Planning Area Industry
(Source: 2010 Census)

Industry	RPV		RHE	
	Number	Percent %	Number	Percent %
Civilian employed Population (16 and over)	17,588	100.0	3,404	100.0
Agriculture, forestry, fishing and hunting, and mining	0	0.0	11	0.3
Construction	356	2.0	206	6.1
Manufacturing	3,145	17.9	461	13.5
Wholesale Trade	1,263	7.2	128	3.8
Retail Trade	1,506	8.6	244	7.2
Transportation and Warehousing, and Utilities	1,234	7.0	151	4.4
Information	355	2.0	50	1.5
Finance and insurance, and real estate and rental and leasing	1,200	6.8	429	12.6
Professional, scientific, and management, and administrative and waste management services	2,524	14.4	604	17.7
Educational services, and health care and social assistance	3,853	21.9	764	22.4
Arts, entertainment, and recreation, and accommodation and food services	660	3.8	135	4.0
Other services, except public administration	771	4.4	103	3.0
Public administration	721	4.1	118	3.5

Table 2-4: Planning Area Occupation
(Source: 2010 Census)

Occupation	RPV		RHE	
	Number	Percent %	Number	Percent %
Civilian employed population (16 years and over)	17,588	100.00	3,404	100.0
Management, business, science, and arts occupations	11,161	63.5	2,200	64.6
Service occupations	1,156	6.6	197	5.8
Sales and office occupations	3,984	22.7	804	23.6
Natural resources, construction, and maintenance occupations	374	2.1	133	3.9

Occupation	RPV		RHE	
	Number	Percent %	Number	Percent %
Production, transportation, and material moving occupations	913	5.2	70	2.1

Mitigation activities are needed at the business level to ensure the safety and welfare of workers and limit damage to industrial infrastructure. Employees are highly mobile, commuting from surrounding areas to industrial and business centers. This creates a greater dependency on roads, communications, accessibility, and emergency plans to reunite people with their families. Before a hazardous event, large and small businesses can develop strategies to prepare for hazards, respond efficiently, and prevent loss of life and property.

Transportation and Commuting Patterns

Private automobiles are the dominant means of transportation in Southern California and even more so in the planning area. However, the Peninsula does support MTA Lines 225, 226 and 444 as its means of public transportation. MTA (Metropolitan Transportation Authority) provides both Cities with bus services to various points in the Los Angeles County metropolitan area. In addition to the MTA, the Peninsula Verdes Peninsula Transit Authority (PVPTA) provides six fixed bus routes throughout the Peninsula, which operate primarily on school days and connect with the MTA lines. The PVPTA also provides a dial-a-ride service for seniors and disabled citizens.

The planning area's road system consists primarily of residential streets serving the various single-family neighborhoods. For example, in Rancho Palos Verdes there are 103.38 centerline miles of residential street, 2.97 miles of collector streets, and 36.47 centerline miles of arterial roadways. There are no bridges in the planning area. The mean travel time to work for the residents of both cities is around 33.1 minutes.

Major external routes serving the planning area include the Harbor Freeway, San Diego Freeway, and Pacific Coast Highway to the north. According to the Rancho Palos Verdes General Plan, the major arterials (provides connections with other arterials and may eventually link-up with major highways) are Hawthorne Boulevard, Western Avenue, Palos Verdes Drive West, and Palos Verdes Drive South. According to the Rolling Hills Estates General Plan, the major arterials are Crenshaw Boulevard, Hawthorne Boulevard, and Palos Verdes Drive North. The planning area is served by the 110 and 405 freeways, which connect the Cities to adjoining parts of Los Angeles County.

Part II: HAZARD ANALYSIS

Section 3: Risk Assessment

What is a Risk Assessment?

Conducting a risk assessment can provide information regarding: the location of hazards; the value of existing land and property in hazard locations; and an analysis of risk to life, property, and the environment that may result from hazardous events. Specifically, the five levels of a risk assessment are as follows:

1. *Hazard Identification*
2. *Profiling Hazard Events*
3. *Vulnerability Assessment/Inventory of Existing Assets*
4. *Risk Analysis*
5. *Assessing Vulnerability/Analyzing Development Trends*

1) Hazard Identification

This section is the description of the geographic extent, potential intensity, and the probability of occurrence of a given hazard. Maps are used in this plan to display hazard identification data. The Cities identified a wide range of natural, human-caused, and technological hazards based on the State of California Multi-Hazard Mitigation Plan, County of Los Angeles All-Hazard Mitigation Plan, the Cities' General Plans, and the Cities' Emergency Operations Plans to identify all possible hazard sources. These hazards included: earthquake, flood, wildfire, landslide, windstorm, dam failure, tsunami, seiche, terrorism, public health emergency, infestation, drought, climate change, civil disobedience, transportation emergency, power failure, and agricultural loss. The Planning Team identified five hazards posing the greatest threat to the planning area. These hazards – earthquakes, wildfires, earth movement, and tsunami, – were identified through an extensive process involving research of existing documents and input from the Planning Team. It's important to note that "flooding" was eliminated as a primary or significant hazard although the "secondary impacts" of flooding are identified in the Wildfire and Earth Movement Hazard-Specific Sections.

For the sake of public education, the Planning Team opted to also include a discussion on Technological & Human-Caused Hazards, although those scenarios pose a less significant threat to the planning area. The geographic extent of each of the identified hazards has been identified by the Team utilizing the maps and data contained in the General Plans and MHFP Threat Assessments. Utilizing FEMA's Calculated Priority Risk Index (CPRI) ranking technique, the Planning Team concluded that all of the identified hazards posed a significant threat against the planning area. The hazard ranking system is described in Table 3-1: Calculated Priority Risk Index, while the actual ranking is shown in Table 3-2: Calculated Priority Risk Index Ranking for Planning Area.

*Repetitive Loss Properties**

According to FEMA documentation, the planning area does not include any repetitive loss properties.

*** ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B4**

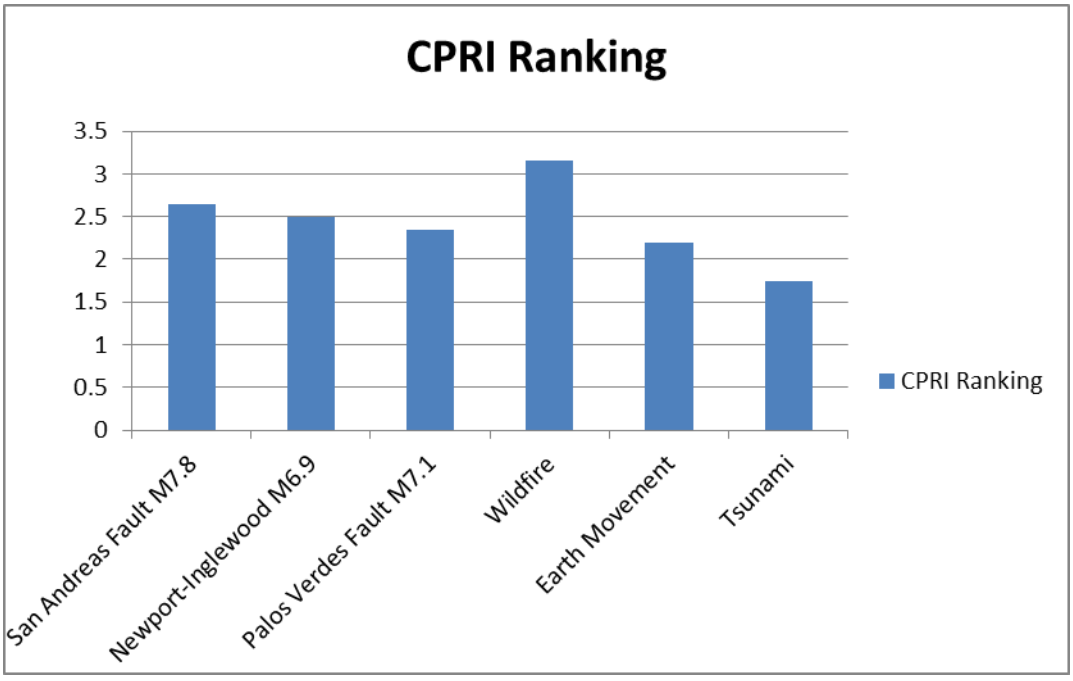
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))

Table 3-1: Calculated Priority Risk Index
(Source: FEMA G235 Emergency Planning Course, 2010)

CPRI Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index Value	
Probability	Unlikely	Extremely rare with no documented history of occurrences or events. Annual probability of less than 1 in 1,000 years.	1	45%
	Possibly	Rare occurrences. Annual probability of between 1 in 100 years and 1 in 1,000 years.	2	
	Likely	Occasional occurrences with at least 2 or more documented historic events. Annual probability of between 1 in 10 years and 1 in 100 years.	3	
	Highly Likely	Frequent events with a well-documented history of occurrence. Annual probability of greater than 1 every year.	4	
Magnitude/ Severity	Negligible	Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure. Injuries or illnesses are treatable with first aid and there are no deaths. Negligible loss of quality of life. Shut down of critical public facilities for less than 24 hours.	1	30%
	Limited	Slight property damage (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). Injuries or illnesses do not result in permanent disability, and there are no deaths. Moderate loss of quality of life. Shut down of critical public facilities for more than 1 day and less than 1 week.	2	
	Critical	Moderate property damage (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). Injuries or illnesses result in permanent disability and at least 1 death. Shut down of critical public facilities for more than 1 week and less than 1 month.	3	
	Catastrophic	Severe property damage (greater than 50% of critical and non-critical facilities and infrastructure). Injuries and illnesses result in permanent disability and multiple deaths. Shut down of critical public facilities for more than 1 month.	4	
Warning Time	> 24 hours	Population will receive greater than 24 hours of warning.	1	15%
	12–24 hours	Population will receive between 12-24 hours of warning.	2	
	6-12 hours	Population will receive between 6-12 hours of warning.	3	
	< 6 hours	Population will receive less than 6 hours of warning.	4	
Duration	< 6 hours	Disaster event will last less than 6 hours	1	10%
	< 24 hours	Disaster event will last less than 6-24 hours	2	
	< 1 week	Disaster event will last between 24 hours and 1 week.	3	
	> 1 week	Disaster event will last more than 1 week	4	

Table 3-2: Calculated Priority Risk Index Ranking for Planning Area

Hazard	Probability	Weighted 45% (x.45)	Magnitude Severity	Weighted 30% (x.3)	Warning Time	Weighted 15% (x.15)	Duration	Weighted 10% (x.1)	CPRI Ranking
San Andreas Fault M7.8	3	1.35	2	0.6	4	0.6	1	0.1	**2.65**
Newport-Inglewood M6.9	2	0.9	3	0.9	4	0.6	1	0.1	**2.5**
Palos Verdes Fault M7.1	1	0.45	4	1.2	4	0.6	1	0.1	**2.35**
Wildfire	3	1.35	3	0.9	4	0.6	3	0.3	**3.15**
Earth Movement	2	0.9	2	0.6	4	0.6	1	0.1	**2.2**
Tsunami	1	0.45	2	0.6	4	0.6	1	0.1	**1.75**



2) Profiling Hazard Events

This process describes the causes and characteristics of each hazard and what part of the planning areas facilities, infrastructure, and environment may be vulnerable to each specific hazard. A profile of each hazard discussed in this plan is provided in the Hazard-Specific Analysis (Sections 4-7). Table 3-3 indicates a generalized perspective of the community's vulnerability of the various hazards according to extent (or degree), location, and probability.

Table 3-3: Vulnerability: Location, Extent, and Probability for Planning Area*†

Hazard	Location (Where)	Extent (How Big an Event)	Probability (How Often)*
Earthquake	Entire Planning Area	The Southern California Earthquake Center (SCEC) in 2007 concluded that there is a 99.7 % probability that an earthquake of M6.7 or greater will hit California within 30 years.[1]	Moderate
Wildfire	Throughout Planning Area	Severe FRAP Ratings	High
Earth Movement	Throughout Planning Area	Earthquake-induced and rain-induced landslide events possibly impacting dozens of structures.	Moderate
Tsunami	Shoreline of Rancho Palos Verdes	Limited Run Up	Low
* Probability is defined as: Low = 1:1,000 years, Moderate = 1:100 years, High = 1:10 years			
[1] Uniform California Earthquake Rupture Forecast			

3) Vulnerability Assessment/Inventory of Existing Assets

This is a combination of hazard identification with an inventory of the existing (or planned) property development(s) and population(s) exposed to a hazard. Critical facilities are of particular concern because these locations provide essential equipment or provide services to the general public that are necessary to preserve important public safety, emergency response, and/or disaster recovery functions. The critical facilities have been identified and are illustrated in Table 3-5: Critical Facilities Vulnerable to Hazards.

4) Risk Analysis

Estimating potential losses involves assessing the damage, injuries, and financial costs likely to be sustained in a geographic area over a given period of time. This level of analysis involves using mathematical models. The two measurable components of risk analysis are magnitude of the harm that may result and the likelihood of the harm occurring. Describing vulnerability in terms of dollar losses provides the community and the state with a common framework in which to measure the effects of hazards on assets. For each hazard where data was available, quantitative estimates for potential losses have been included in the hazard assessment. Data

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* ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B1
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))
† ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))

was not available to make vulnerability determinations in terms of dollar losses for all of the identified hazards. The Mitigation Actions Matrix (Section 9: Mitigation Strategies) includes an action item to conduct such an assessment in the future.

5) Assessing Vulnerability/Analyzing Development Trends

This step provides a general description of land uses and development trends within the community so that mitigation options can be considered in land use planning and future land use decisions. This Plan provides a comprehensive description of the character of the planning area in Section 2: Planning Area Profile. This description includes the geography and environment, population and demographics, land use and development, housing and community development, employment and industry, and transportation and commuting patterns. Analyzing these components of the planning area can help in identifying potential problem areas and can serve as a guide for incorporating the goals and ideas contained in this Plan into other community development plans.

Hazard assessments are subject to the availability of hazard-specific data. Gathering data for a hazard assessment requires a commitment of resources on the part of participating organizations and agencies. Each hazard-specific section of the plan includes a section on hazard identification using data and information from City, county, state, or federal sources.

Regardless of the data available for hazard assessments, there are numerous strategies the Cities can use to reduce risk. These strategies are described in the action items detailed in the Mitigation Actions Matrix (Section 9: Mitigation Strategies). Mitigation strategies can further reduce disruption to critical services, reduce the risk to human life, and alleviate damage to personal and public property, and infrastructure.

Federal Requirements for Risk Assessment

Federal regulations for local mitigation plans (44 C.F.R. Section 201.6(c) (2)) require a risk assessment. This risk assessment requirement is intended to provide information that will help communities to identify and prioritize mitigation activities that will reduce losses from the identified hazards. The Federal criteria for risk assessment and information on how the Plan meets those criteria are outlined in Table 3-4: Federal Criteria for Risk Assessment below.

Table 3-4: Federal Criteria for Risk Assessment

Section 322 Plan Requirement	How is this addressed?
Identifying Hazards	Each hazard section includes an inventory of the best available data sources that identify hazard areas. To the extent data are available; the existing maps identifying the location of the hazard were utilized. The Executive Summary and the Risk Assessment of the Plan include a list of the hazard maps.
Profiling Hazard Events	Each hazard section includes documentation of the history, causes, and characteristics of the hazard in the planning area.
Assessing Vulnerability: Identifying Assets	Where data is available, the vulnerability assessment for each hazard addressed in the Plan includes an inventory of all publicly owned land within hazardous areas. Each hazard section provides information on vulnerable areas within the planning area. Mitigation actions for each hazard can be found in Section 9: Mitigation Strategies.
Assessing Vulnerability: Estimating Potential Losses	The Risk Assessment identifies key critical facilities that provide services to the planning area. Assessments have been completed for the hazards addressed in the plan, and quantitative estimates were made for each hazard where data was available.
Assessing Vulnerability: Analyzing Development Trends	The Planning Area Profile Section of this plan provides a description of the development trends in the planning area, including the geography and environment, population and demographics, land use and development, housing and community development, employment and industry, and transportation and commuting patterns.

Critical and Essential Facilities

Examples of facilities critical to government response activities (i.e., life safety, property, and environmental protection) could include: local government 9-1-1 dispatch centers, local government emergency operations centers, local police and fire stations, local public works facilities, local communications centers, schools (shelters), and hospitals. Also, facilities that, if damaged, could cause serious secondary impacts are also considered "critical." A hazardous materials facility is one example of this type of critical facility.

Essential facilities are those facilities that are vital to the continued delivery of key City services or that may significantly impact the City's ability to recover from the disaster. These facilities include but are not limited to: schools (hosting shelters); buildings such as the jail, law enforcement center, public services building, community corrections center, the courthouse, juvenile services building, and other public facilities.

The following tables illustrate the critical and essential facilities within the planning area.

Table 3-5: Critical Facilities Vulnerable to Hazards

Name of Facility	Address	Earthquake	Wildfire	Earth Movement	Tsunami
California Water Service Reservoir	Palos Verdes Drive North/Palos Verdes Drive East (SW corner), RHE	X	X	X	
California Water Service Reservoir	3960 East Crest Road, RPV	X	X		
California Water Service Reservoir	5837 West Crest Road, RPV	X	X		
California Water Service Reservoir	4405 Palos Verdes Drive East, RPV	X	X		
Cox Communications	43 Peninsula Center, RHE	X	X		
FAA Radar Domes	East Crest Road, RPV	X	X		
Los Angeles County Communications Tower	5741 Crestridge Road, RPV	X	X		
Los Angeles County Fire Station No.53	6124 Palos Verdes Drive South, RPV	X	X	X	
Los Angeles County Fire Station No.83	83 Miraleste Plaza, RPV	X	X		
Los Angeles County Fire Station No.106	413 Indian Peak Road, RHE	X	X		
Los Angeles County Sheriff's Station	26123 Narbonne Avenue, Lomita	X			
RHE City Hall and Council Chambers/EOC	4045 Palos Verde Drive North, RHE	X	X		
RHE Maintenance Yard	25851 Hawthorne Boulevard, RHE	X	X		
RPV City Hall/EOC and Public Works Yard	30940 Hawthorne Boulevard, RPV	X	X		
Southern California Edison Substation	Crestridge Road, RPV	X	X		
Southern California Edison Substation	Tarragon Road, RPV	X	X	X	

Table 3-6: Essential Facilities Vulnerable to Hazards

Name of Facility	Address	Earthquake	Wildfire	Earth Movement	Tsunami
Cornerstone Elementary School	6069 Groveoak Place, RPV	X	X		
Crestmont College (Salvation Army)	30840 Hawthorne Boulevard, RPV	X	X		
Crestwood Elementary School	1946 Crestwood Street, RPV	X	X		
Dapplegray Elementary School	3011 Palos Verdes Drive North, RHE	X	X		
Dodson Middle School	28014 Montereina Drive, RPV	X	X		
Marymount College	30800 Palos Verdes Drive East, RPV	X	X		
Mira Catalina Elementary School	30511 Lucania Drive, RPV	X	X		
Miraleste Elementary School	6245 Via Canada, RPV	X	X		
Palos Verdes High School	600 Cloyden Road, PVE	X	X		
Palos Verdes Peninsula High School	27118 Silver Spur Road, RHE	X	X		
Peninsula Center Library	650 Deep Valley Drive, RHE	X	X		
Point Vicente Elementary School	30540 Rue de la Pierre, RPV	X	X		
Post Office – Main Branch	955 Deep Valley Drive, RHE	X	X		
Rancho Vista Elementary School	4323 Palos Verdes Drive North, RHE	X	X		
Ridgecrest Intermediate School	28915 Northbay Road, RPV	X	X		
Silver Spur Elementary School	5500 Ironwood Street, RPV	X	X		
Soleado Elementary School	27800 Longhill Drive, RPV	X	X		
Vista Grande Elementary School	7032 Purpleridge Drive, RPV	X	X		

Land and Development

Development in Southern California from the earliest days was a cycle of boom and bust. The Second World War however dramatically changed that cycle. Military personnel and defense workers came to Southern California to fill the logistical needs created by the war effort. The available housing was rapidly exhausted and existing commercial centers proved inadequate for the influx of people. Immediately after the war, construction began on the freeway system, and the face of Southern California was forever changed. Home developments and shopping centers sprung up everywhere and within a few decades the urbanized portions of Southern California were virtually built out. This pushed new development further and further away from the urban center.

The General Plans of the two cities address the use and development of private land, including residential and commercial areas. This plan is one of the City's most important tools in addressing environmental challenges including transportation and air quality; growth management; conservation of natural resources; clean water and open spaces. Although the planning area is distinct from most of the surrounding areas in Los Angeles County due to its unique topography and low density pattern of development, its exposure to hazards is largely the same than those that affect all of Southern California.

Impacts to Types of Structures

The RPV and RHE General Plans identify a broad range of land uses and the Building Code identifies several building types. In general terms, structures are categorized as residential, commercial, institutional, industrial, recreational, or agricultural.

Table 3-7: Impacts to Existing and Future Types of Structures in City of Rancho Palos Verdes

Category of Structure	Earthquake	Wildfire	Earth Movement	Tsunami
Natural Environment / Hazard Area (17.7%)	X	X	X	
Urban Land Areas:				
Residential (63.3%)	X	X	X	X
Commercial (3.0%)	X	X		
Institutional (3.5%)	X	X	X	
Recreational (5.4%)	X	X	X	
Utility (.27%)	X	X		
Open Space Preservation (6.8%)	X	X		

Table 3-8: Impacts to Existing and Future Types of Structures in City of Rolling Hills Estates

Category of Structure (% of Total Land Use)	Earthquake	Wildfire	Earth Movement	Tsunami
Residential (59%)	X	X	X	
Commercial/Industrial (7%)	X	X	X	
Open Space (15%)	X	X	X	
Institutional/Public (15%)	X	X	X	

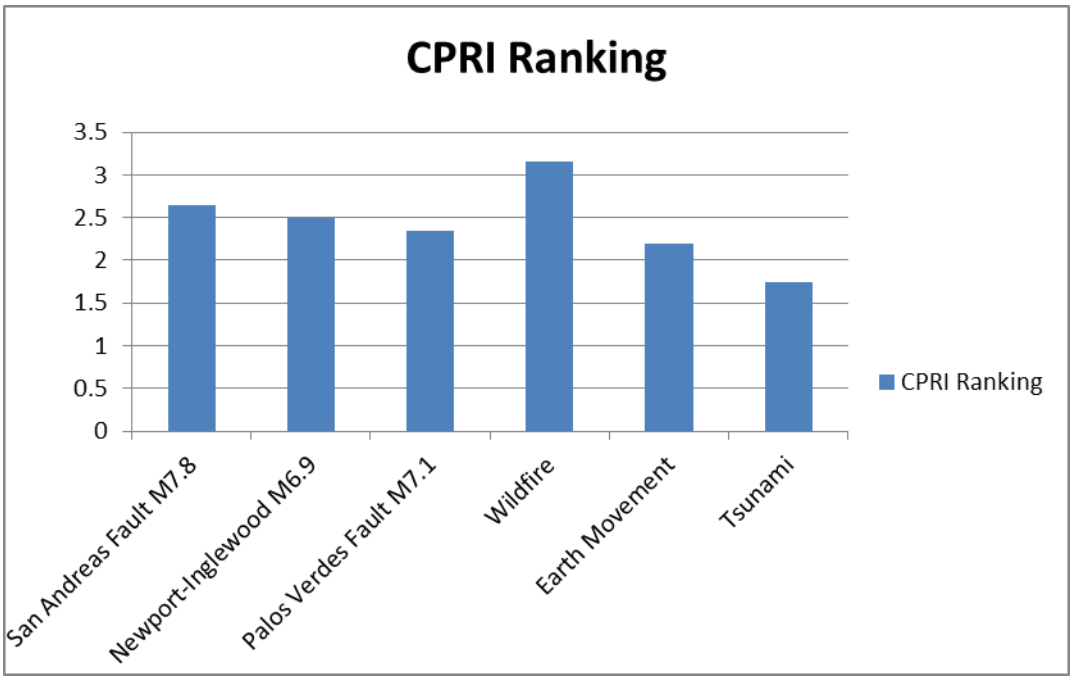
Table 3-9: Hazards Summary

Hazards	Earthquake	Wildfire	Earth Movement	Tsunami
Rancho Palos Verdes	X	X	X	X
Rolling Hills Estates	X	X	X	

Summary

Hazard mitigation strategies can reduce the impacts concentrated at large employment and industrial centers, public infrastructure, and critical facilities. Hazard mitigation for industries and employers may include developing relationships with emergency management services and their employees before disaster strikes, and establishing mitigation strategies together. Collaboration among the public and private sector to create mitigation plans and actions can reduce the impacts of hazards.

Section 4: Earthquake Hazards



Calculated Priority Risk Index (CPRI)	
Probability:	Likely
Magnitude/Severity:	Critical
Warning Time:	Less than 6 hours
Duration:	Less than 6 hours

Why Are Earthquakes a Threat to the Planning Area?*

In terms of earthquakes, historically the planning area has been extremely lucky. Like the majority of the Los Angeles basin, the Palos Verdes Peninsula was largely uninhabited rangeland during the 7.9M Fort Tejon Earthquake in 1857. Articles in the Palos Verdes News indicate that the planning area sustained only minor property damage and no loss of life as a result of the major earthquakes that have occurred in the Los Angeles area since the area first began to develop rapidly following World War II.

The earliest report of any local earthquake-related damage comes from an article that appeared in the Palos Verdes News on April 10, 1968. The newspaper reported on two shocks, 6M and 7.25M in strength, respectively, that occurred a few days earlier broke a water pipe in a drug store located in the City of Palos Verdes Estates; consequently flooding the store's basement and causing an estimated $4,000 to $5,000 in damage. On February 10, 1971, the Palos Verdes News reported that the 6.6M San Fernando Earthquake resulted in 900 homes being

* **ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2**

B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))

without power in the Highridge area north of Crest Road in Rancho Palos Verdes for about an hour. Similarly, an article that appeared in the paper on October 3, 1987 reported that the 5.9M Whittier Narrows Earthquake damaged a bank building in the Peninsula Shopping Center in Rolling Hills Estates, although the extent of the damage was not indicated. In addition, the article mentioned that cellular telephone service was disrupted most of the morning, but no power outages occurred.

The 6.9M Northridge Earthquake of 1994 caused the most widespread, although still relatively minor damage within the planning area. On January 20, 1994, the Palos Verdes News reported that local damage consisted of fire and smoke damage to a liquor store on Western Avenue in Rancho Palos Verdes caused by liquor bottles falling from shelves and then igniting when a refrigeration unit sparked. In the same area, a long section of retaining wall along Western Avenue and Delasonde Drive collapsed onto the public sidewalk. In Rolling Hills Estates, scores of books fell from the shelves at the main library and several shops in the Peninsula Shopping Center in Rolling Hills Estates lost a day of business cleaning up fallen merchandise in the wake of the trembler. Additionally, in the adjacent community of City of Palos Verdes Estates, a portion of the road at Via Valmonte at Via Azalea buckled, breaking a natural gas line under the street. (Palos Verdes News, 1937-2004)

The planning area is located in a seismically active area and near several of the many active and potentially active faults in Southern California. According to the RPV General Plan, two faults are present on the Peninsula: the Palos Verdes and Cabrillo Faults (see Map 4-3: Planning Area Fault Map). The active Palos Verdes Fault trends northwest-southeast and marks the eastern termination of the Palos Verdes Hills. The potentially active Cabrillo Fault also trends northwest-southeast and extends from Cabrillo Beach to near the center of the Peninsula. The Palos Verdes Fault is considered a source of significant earthquake hazard and the Cabrillo Fault is a potentially moderate earthquake hazard. (Source: RPV General Plan, Draft 6/2010)

The Palos Verdes Fault is within a mile of the Palos Verdes Peninsula and poses the most significant earthquake hazard to the planning area due to its proximity. Although Holocene activity has been demonstrated in the southern offshore segment of the fault, the recurrence interval and magnitude of the most recent displacement is still not well characterized and as such the CGS considers it a “Potentially Active” fault. The effect a maximum credible earthquake on the Palos Verdes Fault would have to Southern California is considerable. This potential scenario is estimated to cause loses of $30 billion in building damage, 80 to 1,050 deaths, and 2,400 to 19,000 injuries (OES, 2007).

In addition to the Palos Verdes and Cabrillo Faults, several other faults are located within the region that could have an impact on the planning area. According to the MHFP Threat Assessments for both cities, the Peninsula is in the vicinity of several known active and potentially active earthquake faults including the San Andreas, the San Jacinto, Whittier-Elsinore, and the Newport-Inglewood Fault Zones. Scientists have identified almost 100 faults in the Los Angeles area known to be capable of a magnitude 6.0 or greater earthquake. The January 17, 1994 magnitude 6.7 Northridge Earthquake (thrust fault), which produced severe ground motions, caused 57 deaths, 9,253 injuries and left over 20,000 displaced. Scientists have stated that such devastating shaking should be considered the norm near any large thrust earthquake.

Regulatory Background

The State regulates development within California to reduce or mitigate potential hazards from earthquakes or other geologic hazards. Development in potentially seismically active areas is also governed by the Alquist-Priolo Earthquake Fault Zoning Act and the Seismic Hazards Mapping Act.

Chapter 16A, Division IV of the California Building Code (CBC), titled "Earthquake Design" states that "The purpose of the earthquake provisions herein is primarily to safeguard against major structural failures or loss of life." The CBC and the Uniform Building Code (UBC) regulate the design and construction of excavations, foundations, building frames, retaining walls, and other building elements to mitigate the effects of seismic shaking and adverse soil conditions. The procedures and limitations for the design of structures are based on site characteristics, occupancy type, configuration, structural system, height, and seismic zonation. Seismic zones are mapped areas (Figure 16A-2 of the CBC and Figure 16-2 of the UBC) that are based on proximity to known active faults and the potential for future earthquakes and intensity of seismic shaking. Seismic zones range from 0 to 4, with areas mapped as Zone 4 being potentially subject to the highest accelerations due to seismic shaking and the shortest recurrence intervals. According to the 1997 UBC, and the 1998 CBC, the planning area is within Seismic Zone 4.

The 1933 Long Beach Earthquake resulted in the Field Act, affecting school construction.

The 1933 Long Beach Earthquake resulted in the Field Act, affecting school construction. The 1971 Sylmar Earthquake brought another set of increased structural standards. Similar re-evaluations occurred after the 1989 Loma Prieta Earthquake and 1994 Northridge Earthquake. These code changes have resulted in stronger and more earthquake resistant structures.

The purpose of the Alquist-Priolo Earthquake Fault Zoning Act of 1972 (renamed in 1994) is "to regulate development near active faults so as to mitigate the hazard of surface fault rupture." The State Geologist (chief of the Division of Mines and Geology) is required to delineate Earthquake Fault Zones (formerly known as "Special Studies Zones") along known active faults. As defined by the California Division of Mines and Geology (DMG), an active fault is one which has had surface displacement within Holocene time (roughly the last 11,000 years) and/or has an instrumental record of seismic activity. Potentially active faults are those which show evidence of surface displacement during Quaternary time (roughly the last 2 million years), but for which evidence of Holocene movement has not been established. The DMG evaluates faults on an individual basis to determine if a fault will be classified as an Alquist-Priolo Earthquake Fault Zone. In general, faults must meet certain DMG criteria, including seismic activity, historic rupture, and geologic evidence to be zoned as an Earthquake Fault Zone. Cities and counties affected by the zones must regulate certain development within the zones. They must withhold development permits for sites within the zones until geologic investigations demonstrate that the sites are not threatened by surface displacement from future faulting. Typically, structures for human occupancy are not allowed within 50 feet of the trace of an active fault.

The Seismic Hazard Mapping Act was adopted in 1990 for the purpose of protecting public safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure caused by earthquakes. The Seismic Hazard Mapping Act requires that the State Geologist delineate the various seismic hazard zones. Cities, counties, or other permitting authorities are

required to regulate certain development projects within the zones. They must withhold development permits for a site within a zone until the geologic conditions are investigated and appropriate mitigation measures, if any, are incorporated into the development plans. In addition, sellers (and their agents) of real property within a mapped hazard zone must disclose that the property lies within such a zone at the time of sale.

Following major earthquakes, extensive search and rescue operations may be required to assist trapped or injured persons. Emergency medical care, food and temporary shelter would be required for injured or displaced persons. In the event of a truly catastrophic earthquake, identification and burial of the dead would pose difficult problems. Mass evacuation may be essential to save lives, particularly in areas below dams and/or reservoirs. Many families could be separated, particularly if the earthquake should occur during working hours, and a personal inquiry or locator system would be essential to maintain morale.

Emergency operations could be seriously hampered by the loss of communications and damage to transportation routes within, and to and from, the disaster area and by the disruption of public utilities and services.

Extensive federal assistance could be required and could continue for an extended period. Efforts would be required to remove debris and clear roadways, demolish unsafe structures, assist in reestablishing public services and utilities, and provide continuing care and welfare for the affected population, including temporary housing for displaced persons.

In general, the population is less at risk during non-work hours (if at home) as wood-frame structures are relatively less vulnerable to major structural damage than are typical commercial and industrial buildings. Transportation problems are intensified if an earthquake occurs during work hours, as significant numbers of employees would be stranded in the planning area. An earthquake occurring during work hours would clearly create major transportation problems for those displaced workers.

Measuring and Describing Earthquakes

An earthquake is a sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of the Earth's tectonic plates. The effects of an earthquake can be felt far beyond the site of its occurrence. They usually occur without warning and, after just a few seconds, can cause massive damage and extensive casualties. Common effects of earthquakes are ground motion and shaking, surface fault ruptures, and ground failure. Ground motion is the vibration or shaking of the ground during an earthquake. When a fault ruptures, seismic waves radiate, causing the ground to vibrate. The severity of the vibration increases with the amount of energy released and decreases with distance from the causative fault or epicenter. Soft soils can further amplify ground motions. The severity of these effects is dependent on the amount of energy released from the fault or epicenter.

One way to express an earthquake's severity is to compare its acceleration to the normal acceleration due to gravity. The acceleration due to gravity is often called "g." A ground motion with a peak ground acceleration of 100%g is very severe. Peak Ground Acceleration (PGA) is a measure of the strength of ground motion. PGA is used to project the risk of damage from future earthquakes by showing earthquake ground motions that have a specified probability (10%, 5%, or 2%) of being exceeded in 50 years. These ground motion values are used for

reference in construction design for earthquake resistance. The ground motion values can also be used to assess relative hazard between sites, when making economic and safety decisions. Another tool used to describe earthquake intensity is the Magnitude Scale. The Magnitude Scale is sometimes referred to as the Richter Scale. The two are similar but not exactly the same. The Magnitude Scale was devised as a means of rating earthquake strength and is an indirect measure of seismic energy released. The Scale is logarithmic with each one-point increase corresponding to a 10-fold increase in the amplitude of the seismic shock waves generated by the earthquake. In terms of actual energy released, however, each one-point increase on the Richter Scale corresponds to about a 32-fold increase in energy released. Therefore, a Magnitude 7 (M7) earthquake is 100 times (10 X 10) more powerful than a M5 earthquake and releases 1,024 times (32 X 32) the energy.

An earthquake generates different types of seismic shock waves that travel outward from the focus or point of rupture on a fault. Seismic waves that travel through the earth's crust are called body waves and are divided into primary (P) and secondary (S) waves. Because P waves move faster (1.7 times) than S waves, they arrive at the seismograph first. By measuring the time delay between arrival of the P and S waves and knowing the distance to the epicenter, seismologists can compute the magnitude for the earthquake.

The duration of an earthquake is related to its magnitude but not in a perfectly strict sense. There are two ways to think about the duration of an earthquake. The first is the length of time it takes for the fault to rupture and the second is the length of time shaking is felt at any given point (e.g. when someone says "I felt it shake for 10 seconds" they are making a statement about the duration of shaking). (Source: www.usgs.gov)

The Modified Mercalli Scale (MMI) is another means for rating earthquakes, but one that attempts to quantify intensity of ground shaking. Intensity under this scale is a function of distance from the epicenter (the closer to the epicenter the greater the intensity), ground acceleration, duration of ground shaking, and degree of structural damage. This rates the level of severity of an earthquake by the amount of damage and perceived shaking (Table 4-1: Modified Mercalli Intensity Scale).

Table 4-1: Modified Mercalli Intensity Scale

MMI Value	Description of Shaking Severity	Summary Damage Description Used on Maps since Maps	Full Description
I			Not Felt
II			Felt by persons at rest, on upper floors, or favorably placed.
III			Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.
IV			Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing motorcars rock. Windows, dishes, doors rattle. In the upper

Table 4-1: Modified Mercalli Intensity Scale

MMI Value	Description of Shaking Severity	Summary Damage Description Used on Maps since Maps	Full Description
			range of IV, wooden walls and frame creak.
V	Light	Pictures Move	Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clock stop, start, change rate.
VI	Moderate	Objects Fall	Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knickknacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D cracked.
VII	Strong	Nonstructural Damage	Difficult to stand. Noticed by drivers of motorcars. Hanging objects quiver. Furniture broken. Damage to masonry, including cracks. Weak chimneys broken at roofline. Fall of plaster, loose bricks, stones, tiles, cornices. Some cracks in masonry C. Small slides and caving in along sand or gravel banks. Concrete irrigation ditches damaged.
VIII	Very Strong	Moderate Damage	Steering of motorcars affected. Damage to masonry C, partial collapse. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, and elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Cracks in wet ground and on steep slopes.
IX	Violent	Heavy Damage	General panic. Damage to masonry buildings ranges from collapse to serious damage unless modern design. Wood-frame structures rack, and, if not bolted, shifted off foundations. Underground pipes broken.
X	Very Violent	Extreme Damage	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land.
XI			Rails bent greatly. Underground pipelines completely out of services.
XII			Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into air.

Historic Earthquakes in Southern California

Since seismologists started recording and measuring earthquakes, there have been tens of thousands of recorded earthquakes in Southern California, most with a magnitude below three. No community in Southern California is beyond the reach of a damaging earthquake. Table 4-2: Earthquake Events in the Southern California Region describes the historical earthquake events that have affected Southern California.

Historically, the planning area has generally been spared a major destructive earthquake. However, based on a search of earthquake databases of the United States Geological Survey (USGS) - National Earthquake Information Center (NEIC), several major earthquakes (Magnitude 6.0 or more) have been recorded within approximately 100 kilometers of the project area since 1769.

Table 4-2: Historical Earthquakes near Los Angeles County (Source: http://earthquake.usgs.gov/regional/sca/ca_eqs.php)

Date	Location	Maximum Magnitude (M)*
12/8/1812	Wrightwood	7.0
12/16/1858	San Bernardino Region	6.0
7/30/1894	Lytle Creek Region	6.0
4/21/l918	San Jacinto	6.9
7/23/1923	San Bernardino Region	6.0
3/11/1933	Long Beach	6.3
2/9/1971	San Fernando	6.5
10/1/1987	Whittier Narrows	5.8

To better understand the earthquake hazard, the scientific community has looked at historical records and accelerated research on those faults that are the sources of the earthquakes occurring in the Southern California region. Historical earthquake records can generally be divided into records of the pre-instrumental period and the instrumental period. In the absence of instrumentation, the detection of earthquakes are based on observations and felt reports, and are dependent upon population density and distribution. Since California was sparsely populated in the 1800s, the detection of pre-instrumental earthquakes is relatively difficult. However, two very large earthquakes, the Fort Tejon in 1857 (M7.9) and the Owens Valley in 1872 (M7.6) are evidence of the tremendously damaging potential of earthquakes in Southern California. In more recent times two M7.3 earthquakes struck Southern California, in Kern County (1952) and Landers (1992).

The damage from these four large earthquakes was limited because they occurred in areas which were sparsely populated at the time they happened. The seismic risk is much more severe today than in the past because the population at risk is in the millions, rather than a few hundred or a few thousand persons.

Impact of Earthquakes in the Planning Area*

Based on the risk assessment, it is evident that earthquakes will continue to have potentially devastating economic impacts to certain areas of the planning area. Impacts that are not quantified, but can be anticipated in future events, include:

- ✓ Injury and loss of life;
- ✓ Commercial and residential structural damage;
- ✓ Disruption of and damage to public infrastructure;
- ✓ Secondary health hazards (e.g. mold and mildew);
- ✓ Damage to roads/bridges resulting in loss of mobility;
- ✓ Significant economic impact (jobs, sales, tax revenue) upon the community;
- ✓ Negative impact on commercial and residential property values; and
- ✓ Significant disruption to students and teachers as temporary facilities and relocations would likely be needed.

Severity

A major earthquake occurring in or near the planning area could cause many deaths and injuries, extensive property damage, fires, hazardous material spills, and other dangers. Aftershocks and the secondary effects of fire, hazardous material/chemical accidents, reservoirs, and waterways could aggravate the situation.

The time of day and season of the year would have a profound impact on the number of dead and injured and the amount of property damage. Such an earthquake could exceed the response capabilities of the individual cities, Los Angeles County Operational Area, and the State of California Office of Emergency Services. Support of damage control and disaster relief could be required from other local governments and private organizations, as well as the state and federal governments.

Extensive search and rescue operations could be required to assist trapped persons. Mass evacuation could be essential to save lives, particularly in areas downwind from hazardous material releases. Emergency medical care, food, and temporary shelter could be required by injured or displaced persons.

Many families could be separated, particularly if the earthquake occurs during working hours. A personal inquiry or locator system could be essential to maintain morale. Emergency operations could be seriously hampered by a loss of communications, damage to transportation routes, and/or disruption of public utilities and services.

The economic impact on the Cities could be considerable in terms of lost employment and lost tax base. A major earthquake could

A major earthquake could disrupt, damage, or destroy computer facilities, which could curtail the operations of banks, insurance companies, and other elements of the financial community for several days or weeks.

*** ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3**

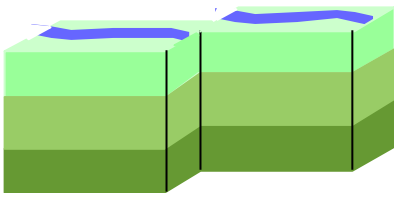
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))

disrupt, damage, or destroy computer facilities, which could curtail the operations of banks, insurance companies, and other elements of the financial community for several days or weeks. This could affect the ability of local government, business, and residents to make payments and purchases. (Source: California Division of Mines and Geology, Special Publication 60, *Earthquake Planning Scenario for a Magnitude 8.3 Earthquake on the San Andreas Fault in Southern California,* 1982.)

Causes of Earthquakes in Southern California

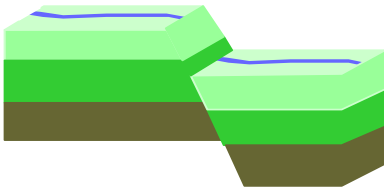
Earthquake Faults

A fault is a fracture between blocks of the earth's crust where either side moves relative to the other along a parallel plane to the fracture.



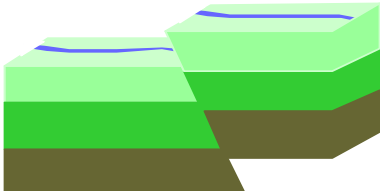
Strike-slip Faults

Strike-slip faults are vertical or almost vertical rifts where the earth's plates move mostly horizontally. From the observer's perspective, if the opposite block looking across the fault moves to the right, the slip style is called a right lateral fault; if the block moves left, the shift is called a left lateral fault.



Dip-slip Faults

Dip-slip faults are slanted fractures where the blocks mostly shift vertically. If the earth above an inclined fault moves down, the fault is called a normal fault, but when the rock above the fault moves up, the fault is called a reverse fault.



Thrust Faults

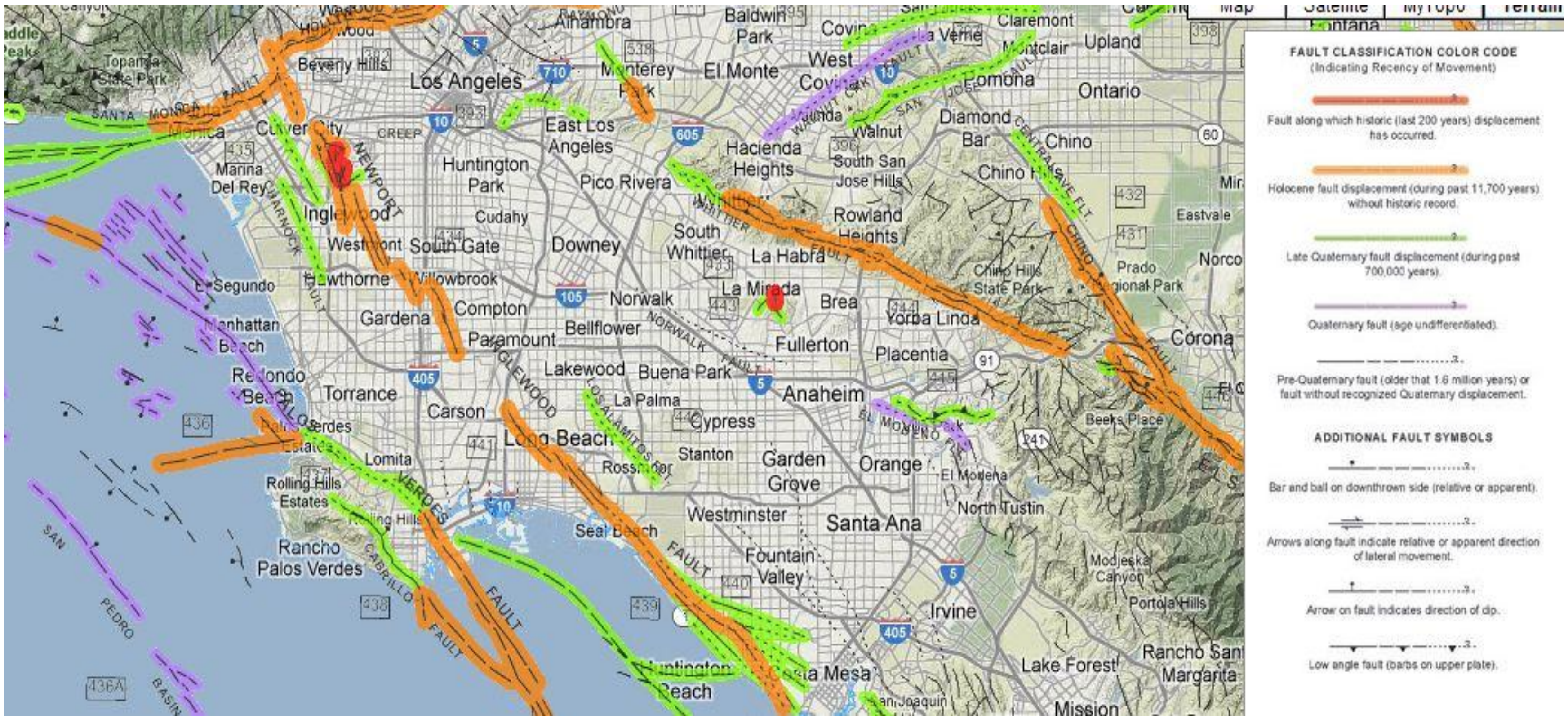
Thrust faults have a reverse fault with a dip of 45 ° or less.

Cal Tech has investigated the San Andreas Fault at Pallett Creek. "The record at Pallett Creek shows that rupture has recurred about every 130 years, on average, over the past 1500 years. But actual intervals have varied greatly, from less than 50 years to more than 300. The physical cause of such irregular recurrence remains unknown." Damage from a great quake on the San Andreas would be widespread throughout Southern California.

Earthquake Hazard Assessment

Map 4-1: Planning Area Fault Map illustrates several major active faults exist in Los Angeles County, including the San Andreas, Newport Inglewood, Elsinore, San Joaquin Hills Fault, Whittier, and Norwalk. The closest active faults to the planning area are the Newport-Inglewood and Whittier fault zones. Other faults such as the Cabrillo and Palos Verdes faults are less than a few miles from the planning area but are considered potentially active faults. The largest active fault near the planning area is the San Andreas Fault which is further than 50 miles northeast from the planning area.

Map 4-1: Planning Area Fault Map
(Source: State of California Department of Conservation)



Earthquake Probable Events
(Source: Southern California Earthquake Data Center, http://www.data.scec.org/)

Elsinore Fault Zone
TYPE OF FAULTING: right-lateral strike-slip
LENGTH: about 180 km (not including the Whittier, Chino, and Laguna Salada Faults)
NEARBY COMMUNITIES: Temecula, Lake Elsinore, Julian
PROBABLE MAGNITUDES: M6.5 - 7.5

Newport-Inglewood Fault Zone
TYPE OF FAULTING: right-lateral; local reverse slip associated with fault steps
LENGTH: 75 km
NEAREST COMMUNITIES: Culver City, Inglewood, Gardena, Compton, Signal Hill, Long Beach, Seal Beach, Huntington Beach, Newport Beach, Costa Mesa
PROBABLE MAGNITUDES: M6.0 - 7.4

Palos Verdes Fault Zone
TYPE OF FAULT: right-reverse
LENGTH: roughly 80 km
NEARBY COMMUNITIES: San Pedro, Palos Verdes Estates, Torrance, Redondo Beach
PROBABLE MAGNITUDES: M6.0 - 7.0 (or greater?); fault geometries may allow only partial rupture at any one time

San Andreas Fault Zone
TYPE OF FAULT: right-lateral strike-slip
LENGTH: 1200 km (550 km south from Parkfield, CA and 650km northward)
NEARBY COMMUNITY: Parkfield, Frazier Park, Palmdale, Wrightwood, San Bernardino, Banning, Indio
PROBABLE MAGNITUDES: M6.8 - 8.0

San Jacinto Fault Zone
TYPE OF FAULTING : right-lateral strike-slip; minor right-reverse
LENGTH: 210 km, including Coyote Creek Fault
NEARBY COMMUNITIES: Lytle Creek, San Bernardino, Loma Linda, San Jacinto, Hemet, Anza, Borrego Springs, Ocotillo Wells
PROBABLE MAGNITUDES: M6.5 - 7.5

Whittier Fault
TYPE OF FAULTING: right-lateral strike-slip with some reverse slip
LENGTH: roughly 40 km
NEARBY COMMUNITIES: Yorba Linda, Hacienda Heights, Whittier
PROBABLE MAGNITUDES: M6.0 - 7.2

Vulnerability Assessment

The effects of earthquakes span a large area, and large earthquakes occurring in many parts of the Southern California region would probably be felt throughout the region. However, the degree to which the earthquakes are felt, and the damages associated with them may vary. At risk from earthquake damage are large stocks of old buildings and bridges; many high-tech and hazardous materials facilities; extensive sewer, water, and natural gas pipelines; earth dams; petroleum pipelines; and other critical facilities and private property located in the county. The

relative or secondary earthquake hazards, which are liquefaction, ground shaking, amplification, and earthquake-induced landslides, are just as devastating as the earthquake.

Earthquake Related Hazards

Ground shaking, landslides, liquefaction, and amplification are the specific hazards associated with earthquakes. The severity of these hazards depends on several factors, including soil and slope conditions, proximity to the fault, earthquake magnitude, and the type of earthquake.

Ground Shaking

Ground shaking is the motion felt on the earth's surface caused by seismic waves generated by the earthquake. It is the primary cause of earthquake damage. The strength of ground shaking depends on the magnitude of the earthquake, the type of fault, and distance from the epicenter (where the earthquake originates). Buildings on poorly consolidated and thick soils will typically see more damage than buildings on consolidated soils and bedrock. Seismic activity along nearby or more distant fault zones are likely to cause ground shaking within the planning area.

Fault Rupture

The potential for ground rupture due to fault movement is related to the seismic activity of known fault zones. Known active or potentially active faults that could be the site of ground rupture are limited to the Palos Verdes fault zone which traverses the extreme northeastern corner of the Palos Verdes Peninsula (Source: City of RPV General Plan, Safety Element). Compared with the more active recognized fault zones, the potential for ground rupture due to seismic activity in the City is considered low.

Earthquake-Induced Landslide Potential

Generally, these types of failures consist of rock falls, disrupted soil slides, rock slides, soil lateral spreads, soil slumps, soil block slides, and soil avalanches. Areas having the potential for earthquake-induced landslides generally occur in areas of previous landslide movement, or where local topographic, geological, geotechnical, and subsurface water conditions indicate a potential for permanent ground displacements.

Areas considered for earthquake-induced landslides are generally found in the hill and canyon areas of the planning area and are shown on Maps 4-8 thru 4-10. The landslide potential zones were compiled from USGS. Mapped earthquake-induced landslide potential zones are intended to prompt more detailed, site specific geotechnical studies as required by the Seismic Hazard Mapping Act.

Soil liquefaction is a seismically induced form of ground failure, which has been a major cause of earthquake damage in southern California.

Earthquake-Induced Landslides

Earthquake-induced landslides are secondary earthquake hazards that occur from ground shaking. They can destroy the roads, buildings, utilities, and other critical facilities necessary to

respond and recover from an earthquake. Many communities in Southern California have a high likelihood of encountering such risks, especially in areas with steep slopes.

Liquefaction

Liquefaction occurs when ground shaking causes wet granular soils to change from a solid state to a liquid state. This results in the loss of soil strength and the soil's ability to support weight. Buildings and their occupants are at risk when the ground can no longer support these structures. Liquefaction generally occurs during significant earthquake activity, and structures located on soils such as silt or sand may experience significant damage during an earthquake due to the instability of structural foundations and the moving earth. Many communities in Southern California are built on ancient river bottoms and have sandy soil. In some cases this ground may be subject to liquefaction, depending on the depth of the water table.

Soil liquefaction is a seismically-induced form of ground failure, which has been a major cause of earthquake damage in southern California. During the 1971 San Fernando and 1994 Northridge Earthquakes, significant damage to roads, utility pipelines, buildings, and other structures in the Los Angeles area were caused by liquefaction. Research and historical data indicate that loose, granular materials situated at depths of less than 50 feet with fine (silt and clay) contents of less than 30 percent, which are saturated by a relatively shallow groundwater table are most susceptible to liquefaction. These geological and groundwater conditions exist in parts of southern California and the planning area, typically in valley regions and alleviated floodplains.

For liquefaction to occur, three general conditions must be met. The first condition – strong ground shaking of relatively long duration – can be expected to occur in the planning area as a result of an earthquake on any of the several active faults in the region. The second condition – loose, or unconsolidated, recently deposited sediments consisting primarily of silt and sand – occurs in a large portion of the valley floors, and in the larger canyon bottoms prevalent throughout Los Angeles County. The third condition is water saturated sediments within about 50 feet of the surface.

In accordance with the Seismic Hazard Mapping Act, the California Division of Mines and Geology has evaluated liquefaction susceptibility for most of the planning area. Maps 4-8 through 4-10, Seismic Hazard Zones show the results of these studies.

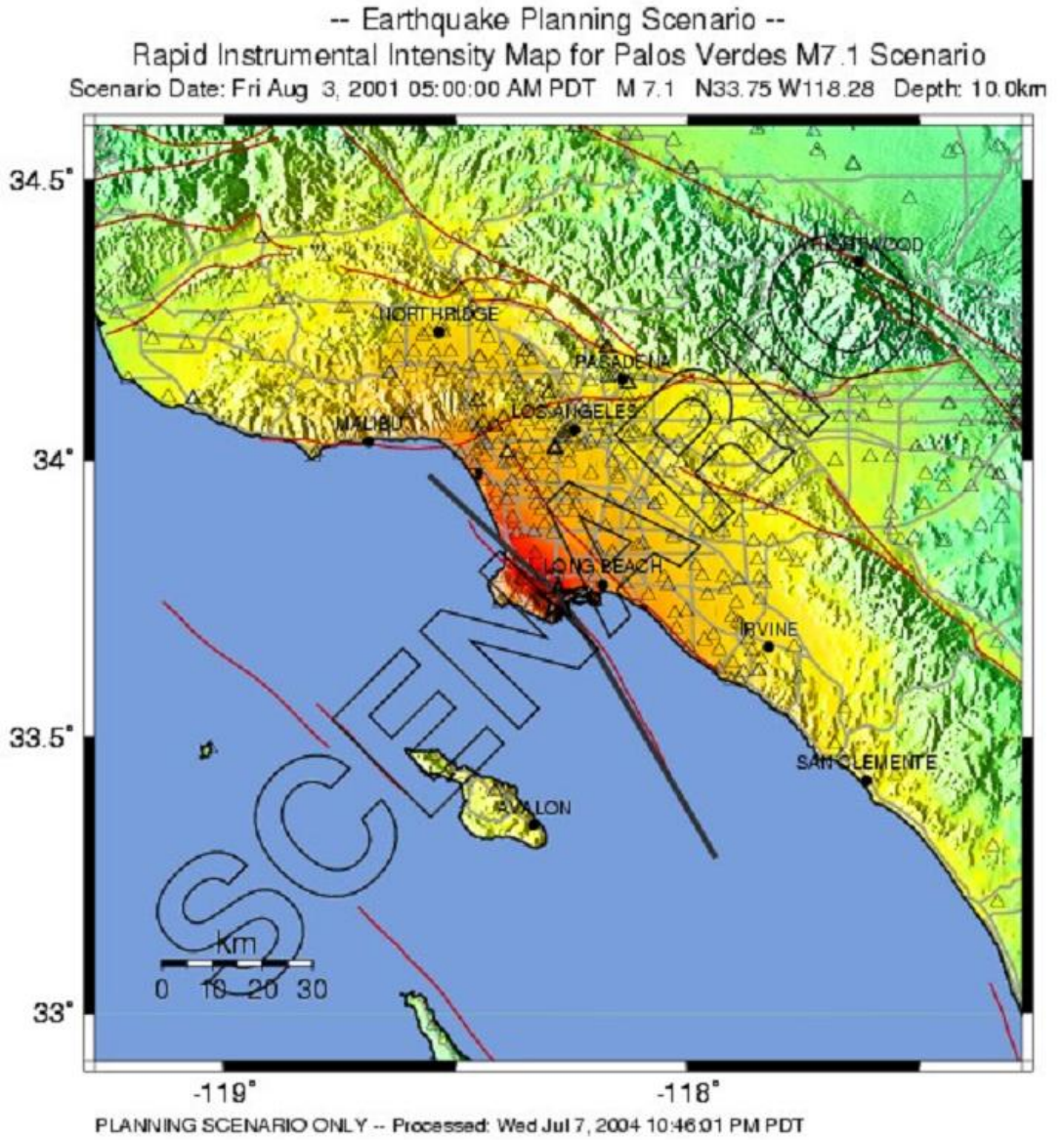
Structure Failure

The planning area is fortunate that most of its buildings have been built under recent building codes and design criteria. In fact, a substantial amount of construction has occurred in the planning area under design standards that take into account some of the lessons learned from the 1971 Sylmar Earthquake.

Amplification

Soils and soft sedimentary rocks near the earth's surface can modify ground shaking caused by earthquakes. One of these modifications is amplification. Amplification increases the magnitude of the seismic waves generated by the earthquake. The amount of amplification is influenced by the thickness of geologic materials and their physical properties. Buildings and structures built on soft and unconsolidated soils can face greater risk. Amplification can also occur in areas with deep sediment filled basins and on ridge top.

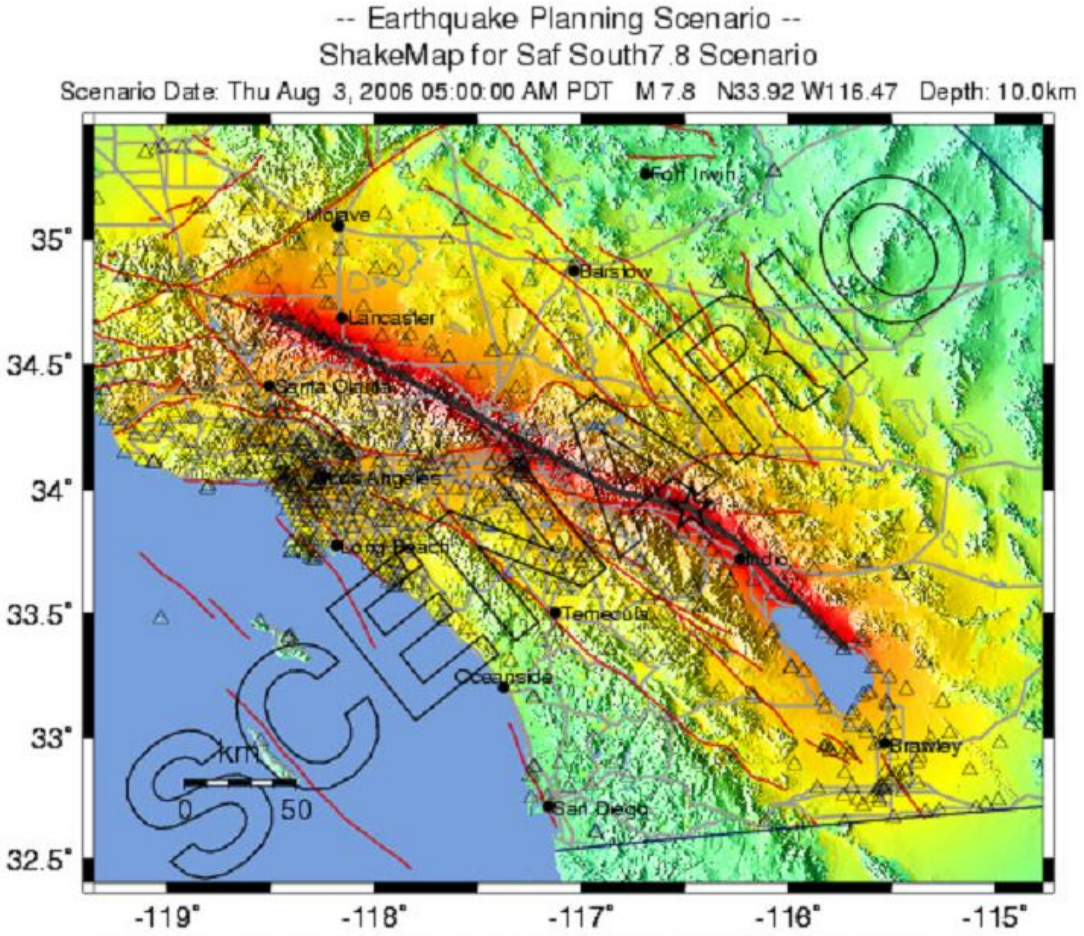
Map 4-2: Seismic Shaking Intensities for the Palos Verdes Fault
(Source: State of California Department of Conservation)



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

S18 Palos-Verdes Fault Scenario M 7.1

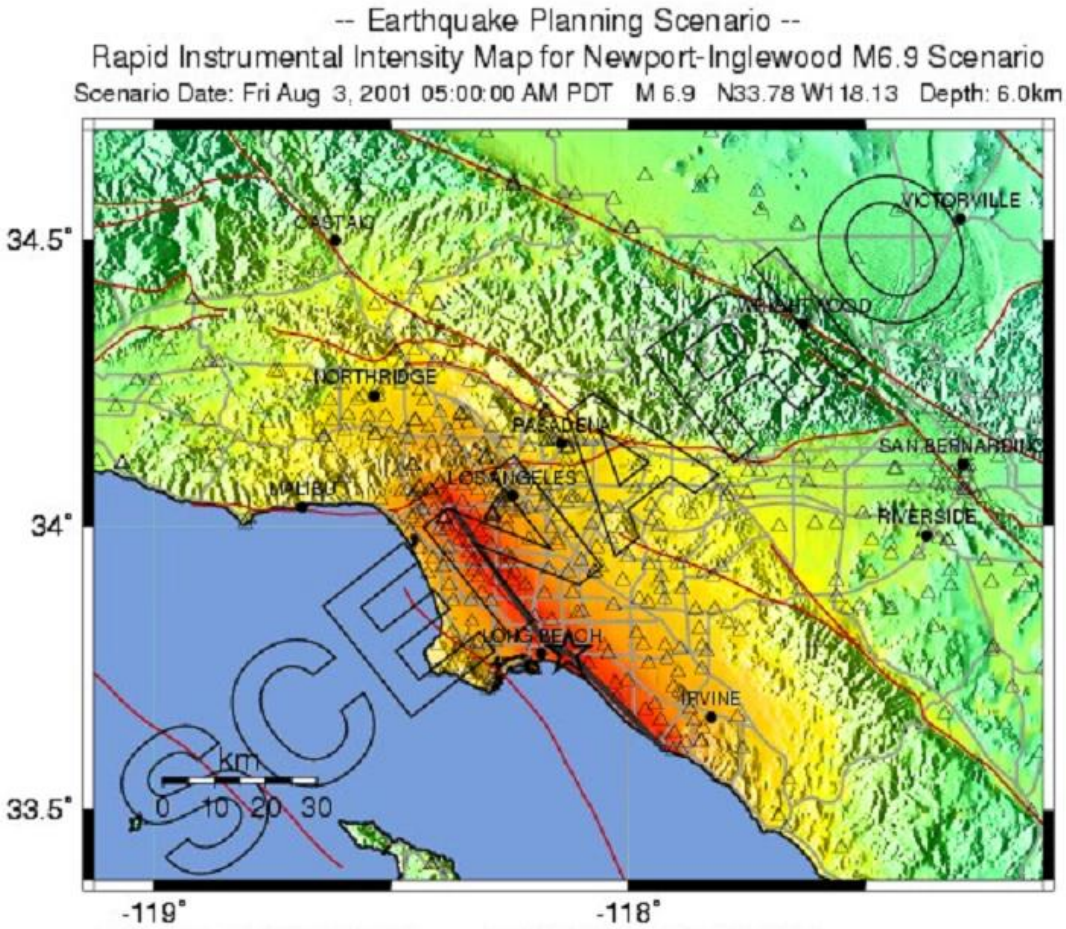
Map 4-3: Seismic Shaking Intensities for the San Andreas Fault
(Source: State of California Department of Conservation)



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

S2 San Andreas Fault - Southern Scenario M 7.8

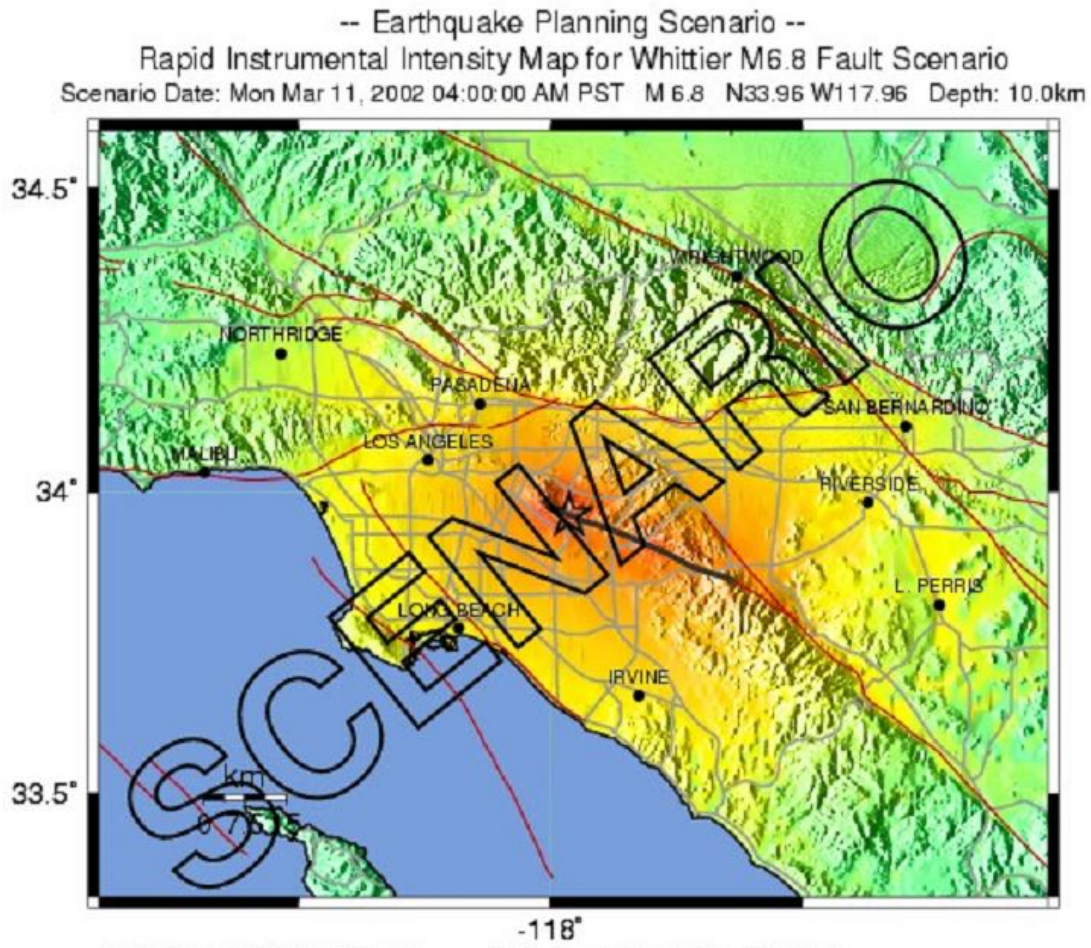
Map 4-4: Seismic Shaking Intensities for the Newport-Inglewood Fault
(Source: State of California Department of Conservation)



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

S17 Newport-Inglewood Fault Scenario M 6.9

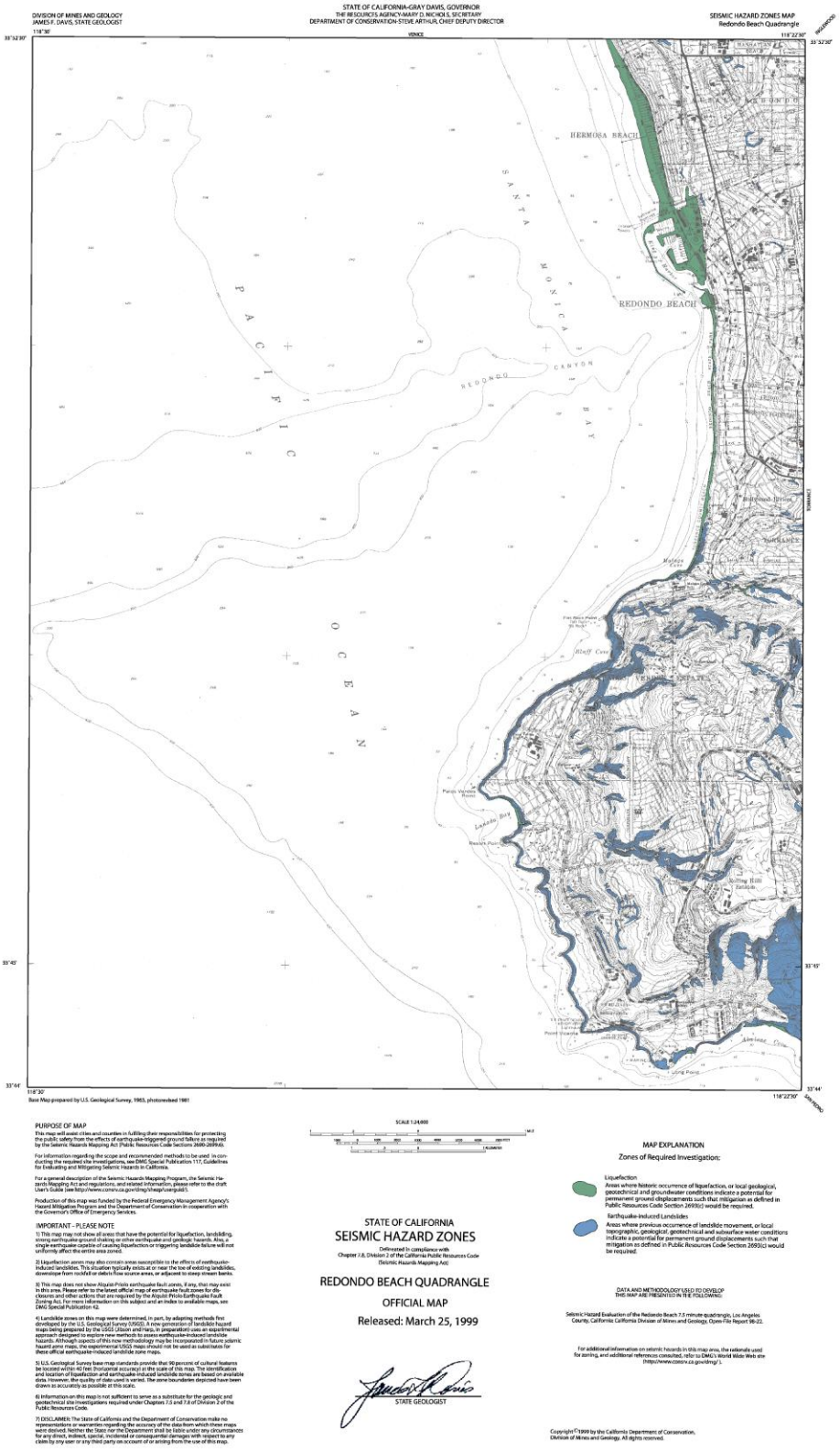
Map 4-5: Seismic Shaking Intensities for the Whittier Fault
(Source: State of California Department of Conservation)



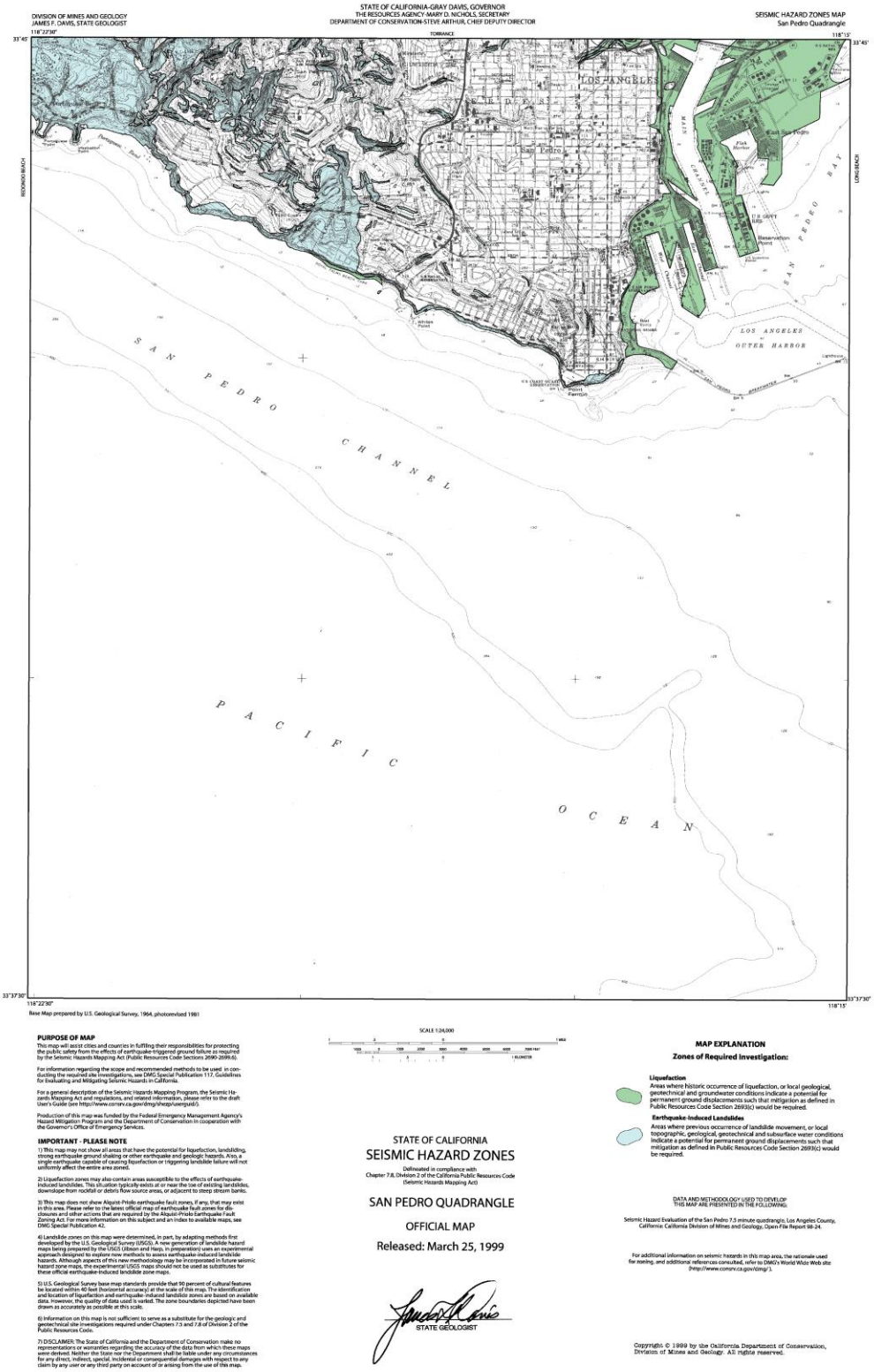
PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC (%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL (cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

S12 Whittier Fault Scenario M 6.8

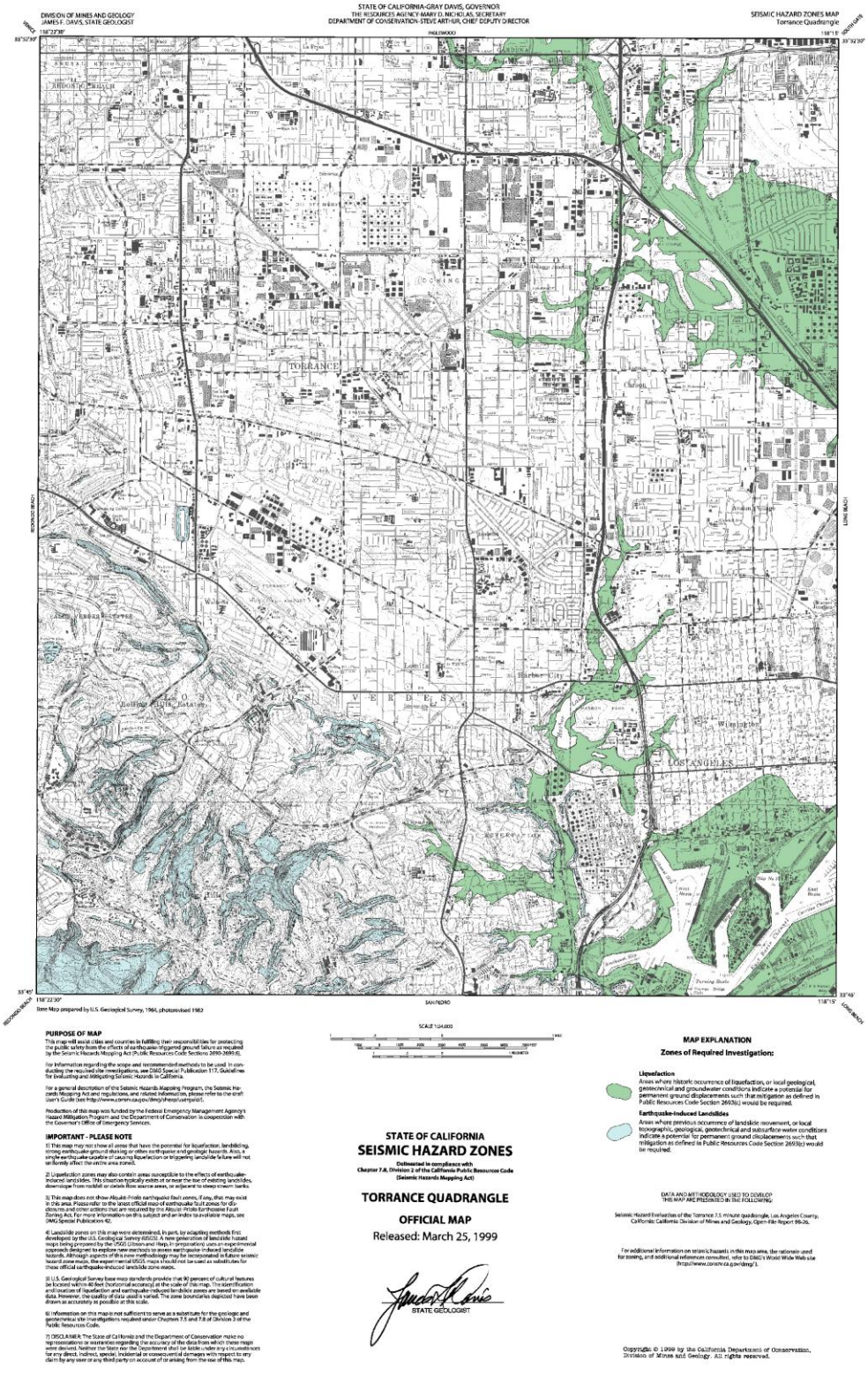
Map 4-6: Seismic Hazard Zones – Redondo Beach Quadrangle (Source: State of California Department of Conservation)



Map 4-7: Seismic Hazard Zones – San Pedro Quadrangle (Source: State of California Department of Conservation)



Map 4-8: Seismic Hazard Zones – Torrance Quadrangle (Source: State of California Department of Conservation)

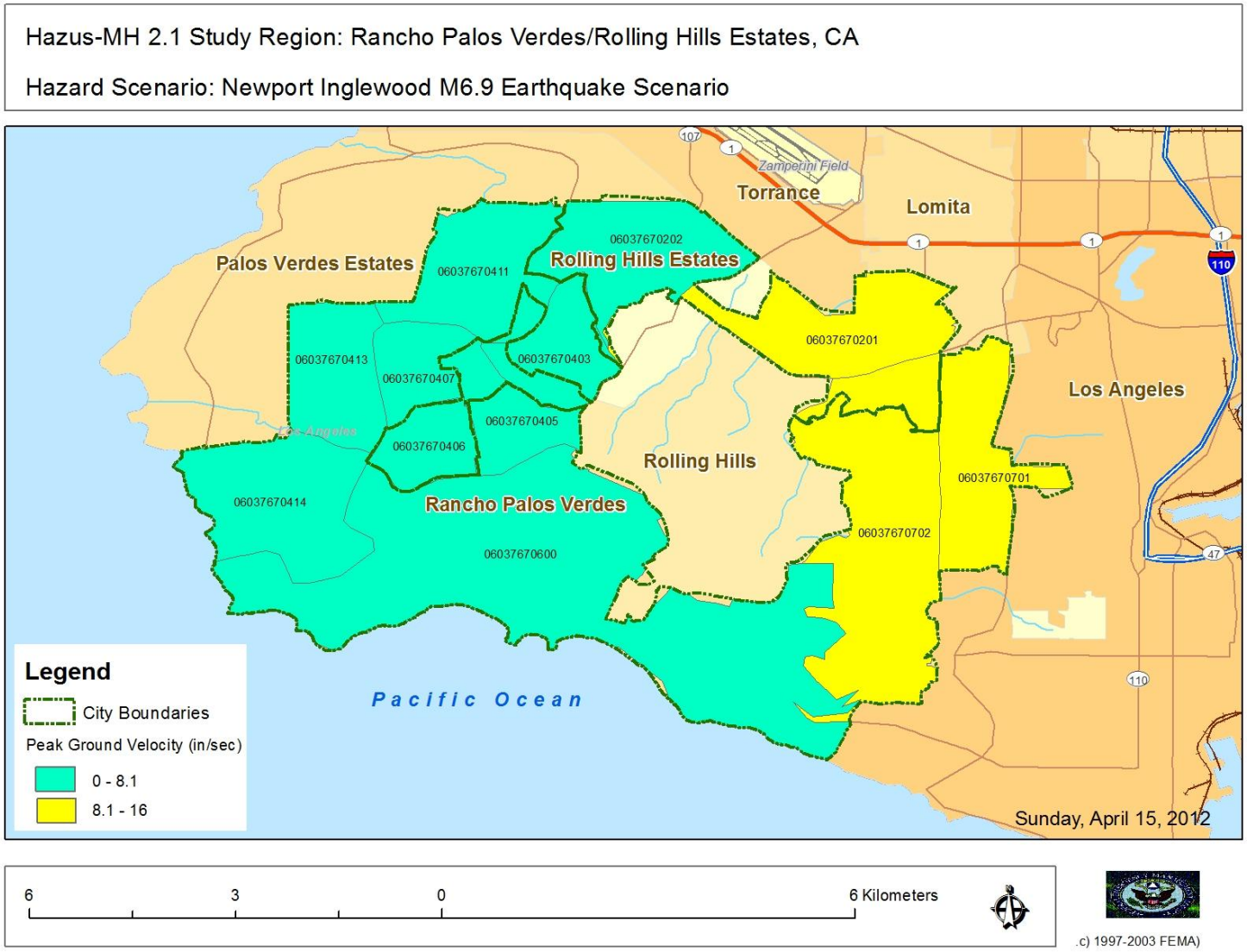


Risk Analysis

Risk analysis is the third phase of a hazard assessment. Risk analysis involves estimating the damage and costs likely to be experienced in a geographic area over a period of time. Factors included in assessing earthquake risk, include population and property distribution in the hazard area, the frequency of earthquake events, landslide susceptibility, buildings, infrastructure, and disaster preparedness of the region. This type of analysis generates estimates of the damages to the planning area due to an earthquake event in a specific location. FEMA's software program, HAZUS, uses mathematical formulas and information about building stock, local geology and the location and size of potential earthquakes, economic data, and other information, to estimate losses from a potential earthquake.

HAZUS software was used in the Plan update to analyze two earthquake scenarios: Newport-Inglewood and Palos Verdes Fault. The HAZUS maps and reports begin on the next page.

Map 4-9: Hazard Scenario: Newport-Inglewood M6.9 Earthquake Scenario
(Source: Emergency Planning Consultants)



Attachment 4-1: HAZUS-MH Earthquake Event Report: Newport-Inglewood M6.9 (Source: Emergency Planning Consultants)

Hazus-MH: Earthquake Event Report

Region Name: RPVRHETracts

Earthquake Scenario: RPVRHETracts6.9

Print Date: April 15, 2012

Totals only reflect data for those census tracts/blocks included in the user's study region.

Disclaimer:
The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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General Description of the Region

Hazus is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

California

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 17.97 square miles and contains 12 census tracts. There are over 19 thousand households in the region which has a total population of 51,341 people (2002 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 18 thousand buildings in the region with a total building replacement value (excluding contents) of 5,630 (millions of dollars). Approximately 94.00 % of the buildings (and 90.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 302 and 0 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 18 thousand buildings in the region which have an aggregate total replacement value of 5,630 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 94% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of 0 beds. There are 22 schools, 0 fire stations, 0 police stations and 0 emergency operation facilities. With respect to high potential loss facilities (HPL), there are 1 dams identified within the region. Of these, 1 of the dams are classified as 'high hazard'. The inventory also includes 1 hazardous material sites, 0 military installations and 0 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 302.00 (millions of dollars). This inventory includes over 45 kilometers of highways, 0 bridges, 645 kilometers of pipes.

Table 1: Transportation System Lifeline Inventory

System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	0	0.00
	Segments	10	302.50
	Tunnels	0	0.00
	Subtotal		**302.50**
Railways	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
	Subtotal		**0.00**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
	Subtotal		**0.00**
Bus	Facilities	0	0.00
	Subtotal		**0.00**
Ferry	Facilities	0	0.00
	Subtotal		**0.00**
Port	Facilities	0	0.00
	Subtotal		**0.00**
Airport	Facilities	0	0.00
	Runways	0	0.00
	Subtotal		**0.00**
	Total		**302.50**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	6.50
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**6.50**
Waste Water	Distribution Lines	NA	3.90
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**3.90**
Natural Gas	Distribution Lines	NA	2.60
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**2.60**
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	0	0.00
		Subtotal	**0.00**
Communication	Facilities	0	0.00
		Subtotal	**0.00**
		Total	**12.90**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	RPVRHETracts6.9
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-118.13
Latitude of Epicenter	33.78
Earthquake Magnitude	6.90
Depth (Km)	2.00
Rupture Length (Km)	35.97
Rupture Orientation (degrees)	0.00
Attenuation Function	West US, Extensional 2008 - Strike Slip

Building Damage

Building Damage

Hazus estimates that about 850 buildings will be at least moderately damaged. This is over 5.00 % of the buildings in the region. There are an estimated 9 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	19	0.13	6	0.15	3	0.37	1	0.98	0	0.96
Commercial	528	3.80	135	3.51	72	9.28	16	23.79	2	20.23
Education	20	0.14	5	0.12	2	0.28	0	0.69	0	0.48
Government	6	0.05	2	0.04	1	0.10	0	0.26	0	0.19
Industrial	113	0.81	32	0.83	20	2.53	5	6.88	1	6.05
Other Residential	548	3.93	152	3.96	42	5.44	7	10.78	1	9.37
Religion	36	0.26	9	0.24	4	0.55	1	1.47	0	1.23
Single Family	12,651	90.87	3,507	91.15	631	81.44	36	55.14	6	61.48
Total	**13,922**		**3,848**		**775**		**65**		**9**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	13,126	94.28	3655	94.98	653	84.18	35	53.11	6	63.13
Steel	152	1.09	44	1.15	30	3.82	7	9.95	1	10.56
Concrete	155	1.11	41	1.06	19	2.48	5	7.41	0	4.77
Precast	119	0.86	35	0.90	25	3.26	6	9.68	1	8.21
RM	330	2.37	56	1.46	35	4.54	9	13.58	0	4.81
URM	36	0.26	15	0.40	11	1.47	4	5.48	1	8.04
MH	3	0.03	2	0.05	2	0.25	1	0.79	0	0.47
Total	**13,922**		**3,848**		**775**		**65**		**9**	

*Note:

RM	Reinforced Masonry
URM	Unreinforced Masonry
MH	Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 0 hospital beds available for use. On the day of the earthquake, the model estimates that only 0 hospital beds (0.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 0.00% of the beds will be back in service. By 30 days, 0.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	22	0	0	22
EOCs	0	0	0	0
PoliceStations	0	0	0	0
FireStations	0	0	0	0

Transportation and Utility Lifeline Damage

Table 6 provides damage estimates for the transportation system.

Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 % After Day 1	With Functionality > 50 % After Day 7
Highway	Segments	10	0	0	10	10
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	323	19	5
Waste Water	194	9	2
Natural Gas	129	3	1
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	19,121	0	0	0	0	0
Electric Power		0	0	0	0	0

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0.02 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 50.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 640 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 27 households to be displaced due to the earthquake. Of these, 14 people (out of a total population of 51,341) will seek temporary shelter in public shelters.

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	2	0	0	0
	Single Family	11	1	0	0
	Total	**13**	**1**	**0**	**0**
2 PM	Commercial	9	2	0	0
	Commuting	0	0	0	0
	Educational	2	0	0	0
	Hotels	0	0	0	0
	Industrial	1	0	0	0
	Other-Residential	0	0	0	0
	Single Family	2	0	0	0
	Total	**15**	**2**	**0**	**0**
5 PM	Commercial	8	1	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	1	0	0	0
	Other-Residential	1	0	0	0
	Single Family	4	0	0	0
	Total	**14**	**2**	**0**	**0**

Economic Loss

The total economic loss estimated for the earthquake is 123.12 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 122.98 (millions of dollars); 11 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 78 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.10	2.21	0.03	0.09	2.43
	Capital-Related	0.00	0.04	2.04	0.02	0.03	2.13
	Rental	1.07	0.48	1.23	0.01	0.05	2.84
	Relocation	3.78	0.29	1.70	0.08	0.35	6.20
	Subtotal	**4.86**	**0.92**	**7.18**	**0.13**	**0.51**	**13.60**
Capital Stock Losses							
	Structural	10.51	0.83	2.30	0.18	0.39	14.21
	Non_Structural	54.88	5.42	8.07	0.72	1.38	70.47
	Content	17.50	1.43	4.35	0.47	0.73	24.47
	Inventory	0.00	0.00	0.12	0.08	0.01	0.21
	Subtotal	**82.89**	**7.69**	**14.84**	**1.45**	**2.51**	**109.38**
	Total	**87.75**	**8.61**	**22.02**	**1.58**	**3.02**	**122.98**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Hazus estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 14 presents the results of the region for the given earthquake.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	302.51	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Subtotal	**302.50**	**0.00**	
Railways	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Light Rail	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Bus	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Ferry	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Port	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Airport	Facilities	0.00	$0.00	0.00
	Runways	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
	Total	**302.50**	**0.00**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	6.50	$0.08	1.30
	Subtotal	**6.45**	**$0.08**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	3.90	$0.04	1.09
	Subtotal	**3.87**	**$0.04**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	2.60	$0.01	0.56
	Subtotal	**2.58**	**$0.01**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Communication	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
	Total	**12.90**	**$0.14**	

Table 14. Indirect Economic Impact with outside aid

(Employment as # of people and Income in millions of $)

LOSS	Total	%

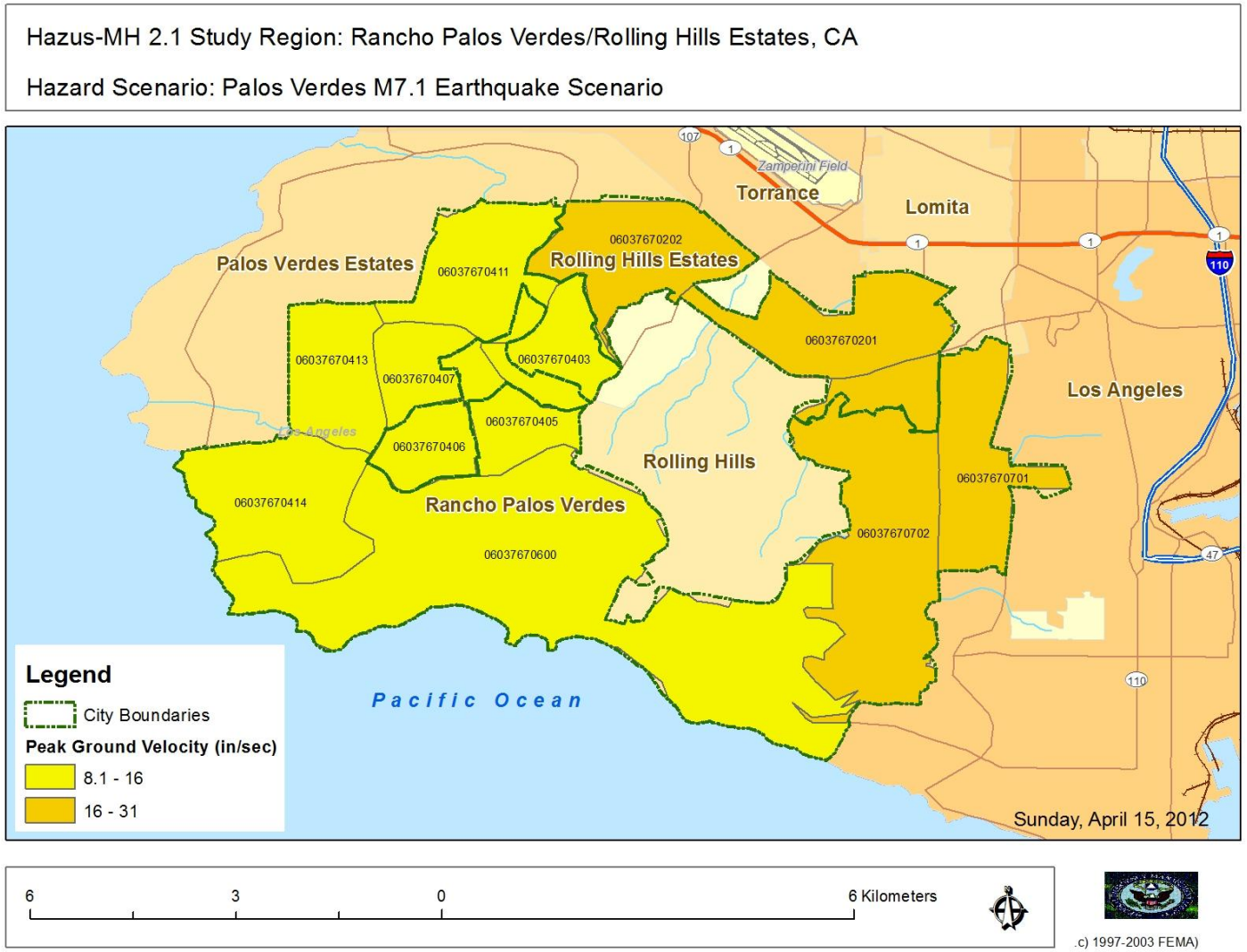
Appendix A: County Listing for the Region

Los Angeles,CA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
California	Los Angeles	51,341	5,091	539	5,630
Total State		**51,341**	**5,091**	**539**	**5,630**
Total Region		**51,341**	**5,091**	**539**	**5,630**

Map 4-10: Hazard Scenario: Palos Verdes M7.1 Earthquake Scenario
(Source: Emergency Planning Consultants)



Attachment 4-2: HAZUS-MH Earthquake Event Report: Palos Verdes M7.1 (Source: Emergency Planning Consultants)

Hazus-MH: Earthquake Event Report

Region Name: RPVRHETracts

Earthquake Scenario: PalosVerdesM7.1

Print Date: April 15, 2012

Totals only reflect data for those census tracts/blocks included in the user's study region.

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Building Inventory

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For essential facilities, there are 0 hospitals in the region with a total bed capacity of 0 beds. There are 22 schools, 0 fire stations, 0 police stations and 0 emergency operation facilities. With respect to high potential loss facilities (HPL), there are 1 dams identified within the region. Of these, 1 of the dams are classified as 'high hazard'. The inventory also includes 1 hazardous material sites, 0 military installations and 0 nuclear power plants.

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	Tunnels	0	0.00
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	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
	Subtotal		**0.00**
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
	Subtotal		**0.00**
Bus	Facilities	0	0.00
	Subtotal		**0.00**
Ferry	Facilities	0	0.00
	Subtotal		**0.00**
Port	Facilities	0	0.00
	Subtotal		**0.00**
Airport	Facilities	0	0.00
	Runways	0	0.00
	Subtotal		**0.00**
	Total		**302.50**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	6.50
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**6.50**
Waste Water	Distribution Lines	NA	3.90
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**3.90**
Natural Gas	Distribution Lines	NA	2.60
	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**2.60**
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
		Subtotal	**0.00**
Electrical Power	Facilities	0	0.00
		Subtotal	**0.00**
Communication	Facilities	0	0.00
		Subtotal	**0.00**
		Total	**12.90**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	PalosVerdesM7.1
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-118.28
Latitude of Epicenter	33.75
Earthquake Magnitude	7.10
Depth (Km)	2.00
Rupture Length (Km)	50.58
Rupture Orientation (degrees)	0.00
Attenuation Function	West US, Extensional 2008 - Strike Slip

Building Damage

Building Damage

Hazus estimates that about 3,531 buildings will be at least moderately damaged. This is over 19.00 % of the buildings in the region. There are an estimated 131 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	9	0.11	8	0.11	7	0.23	3	0.68	1	1.10
Commercial	256	3.21	201	2.82	187	6.30	78	17.71	32	24.58
Education	10	0.13	7	0.11	6	0.20	2	0.54	1	0.64
Government	3	0.04	2	0.03	2	0.07	1	0.21	0	0.23
Industrial	51	0.64	43	0.60	46	1.56	21	4.81	9	6.85
Other Residential	299	3.75	264	3.72	135	4.55	37	8.33	16	11.82
Religion	18	0.23	14	0.20	12	0.39	5	1.11	2	1.49
Single Family	7,335	91.90	6,568	92.41	2,567	86.70	293	66.60	70	53.28
Total	**7,981**		**7,108**		**2,960**		**439**		**131**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	7,597	95.19	6841	96.25	2,668	90.13	298	67.74	70	53.54
Steel	62	0.77	52	0.73	70	2.36	35	8.03	14	11.00
Concrete	74	0.93	62	0.87	51	1.71	24	5.52	9	7.22
Precast	52	0.66	45	0.63	55	1.86	23	5.32	10	7.81
RM	187	2.35	95	1.34	94	3.18	40	9.19	13	10.21
URM	8	0.10	12	0.16	20	0.67	16	3.55	12	9.36
MH	0	0.00	1	0.01	3	0.09	3	0.64	1	0.86
Total	**7,981**		**7,108**		**2,960**		**439**		**131**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 0 hospital beds available for use. On the day of the earthquake, the model estimates that only 0 hospital beds (0.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 0.00% of the beds will be back in service. By 30 days, 0.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	22	0	0	4
EOCs	0	0	0	0
PoliceStations	0	0	0	0
FireStations	0	0	0	0

Transportation and Utility Lifeline Damage

Table 6 provides damage estimates for the transportation system.

Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 % After Day 1	With Functionality > 50 % After Day 7
Highway	Segments	10	0	0	10	10
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	323	100	25
Waste Water	194	50	13
Natural Gas	129	17	4
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	19,121	0	0	0	0	0
Electric Power		3,004	1,708	616	106	5

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0.08 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 43.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 3,160 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 212 households to be displaced due to the earthquake. Of these, 109 people (out of a total population of 51,341) will seek temporary shelter in public shelters.

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	1	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	1	0	0	0
	Other-Residential	11	3	0	1
	Single Family	46	6	0	0
	Total	**60**	**9**	**1**	**1**
2 PM	Commercial	72	19	3	6
	Commuting	0	0	0	0
	Educational	19	5	1	2
	Hotels	0	0	0	0
	Industrial	6	2	0	0
	Other-Residential	2	1	0	0
	Single Family	9	1	0	0
	Total	**108**	**28**	**4**	**8**
5 PM	Commercial	62	17	3	5
	Commuting	0	0	0	0
	Educational	2	1	0	0
	Hotels	0	0	0	0
	Industrial	4	1	0	0
	Other-Residential	4	1	0	0
	Single Family	18	2	0	0
	Total	**90**	**22**	**3**	**6**

Economic Loss

The total economic loss estimated for the earthquake is 475.43 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 474.68 (millions of dollars); 13 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 76 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.57	9.93	0.13	0.36	10.99
	Capital-Related	0.00	0.24	9.21	0.08	0.11	9.64
	Rental	4.83	2.16	4.90	0.04	0.21	12.14
	Relocation	18.19	1.30	7.11	0.26	1.64	28.49
	Subtotal	**23.01**	**4.27**	**31.15**	**0.51**	**2.32**	**61.27**
Capital Stock Losses							
	Structural	39.68	3.70	10.94	0.81	1.89	57.01
	Non_Structural	197.09	22.18	35.31	3.02	5.91	263.51
	Content	64.30	5.59	17.36	1.91	2.85	92.00
	Inventory	0.00	0.00	0.51	0.34	0.04	0.89
	Subtotal	**301.07**	**31.46**	**64.11**	**6.07**	**10.69**	**413.41**
	Total	**324.08**	**35.74**	**95.26**	**6.58**	**13.01**	**474.68**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Hazus estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 14 presents the results of the region for the given earthquake.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	302.51	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Subtotal	**302.50**	**0.00**	
Railways	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Light Rail	Segments	0.00	$0.00	0.00
	Bridges	0.00	$0.00	0.00
	Tunnels	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Bus	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Ferry	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Port	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
Airport	Facilities	0.00	$0.00	0.00
	Runways	0.00	$0.00	0.00
	Subtotal	**0.00**	**0.00**	
	Total	**302.50**	**0.00**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	6.50	$0.45	7.00
	Subtotal	**6.45**	**$0.45**	
Waste Water	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	3.90	$0.23	5.86
	Subtotal	**3.87**	**$0.23**	
Natural Gas	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Distribution Lines	2.60	$0.08	3.01
	Subtotal	**2.58**	**$0.08**	
Oil Systems	Pipelines	0.00	$0.00	0.00
	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Electrical Power	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
Communication	Facilities	0.00	$0.00	0.00
	Subtotal	**0.00**	**$0.00**	
	Total	**12.90**	**$0.76**	

Table 14. Indirect Economic Impact with outside aid

(Employment as # of people and Income in millions of $)

LOSS	Total	%

Appendix A: County Listing for the Region

Los Angeles,CA

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
California	Los Angeles	51,341	5,091	539	5,630
Total State		**51,341**	**5,091**	**539**	**5,630**
Total Region		**51,341**	**5,091**	**539**	**5,630**

Community Earthquake Issues

What is Susceptible to Earthquakes?

Earthquake damage occurs because humans have built structures that cannot withstand severe shaking. Buildings, airports, schools, and lifelines (highways and utility lines) suffer damage in earthquakes and can cause death or injury to humans. The welfare of homes, major businesses, and public infrastructure is very important. Addressing the reliability of buildings, critical facilities, and infrastructure, and understanding the potential costs to government, businesses, and individuals as a result of an earthquake, are challenges faced by the Cities.

Dams

There are a total of 103 dams in Los Angeles County, owned by 23 agencies or organizations, ranging from the Federal government to Home Owner Associations. These dams hold billions of gallons of water in reservoirs. Releases of water from the major reservoirs are designed to protect Southern California from flood waters and to store domestic water. Seismic activity can compromise the dam structures, and the resultant flooding could cause catastrophic flooding. Following the 1971 Sylmar Earthquake the Lower Van Norman Dam showed signs of structural compromise, and tens of thousands of persons had to be evacuated until the dam could be drained. The dam has never been refilled.

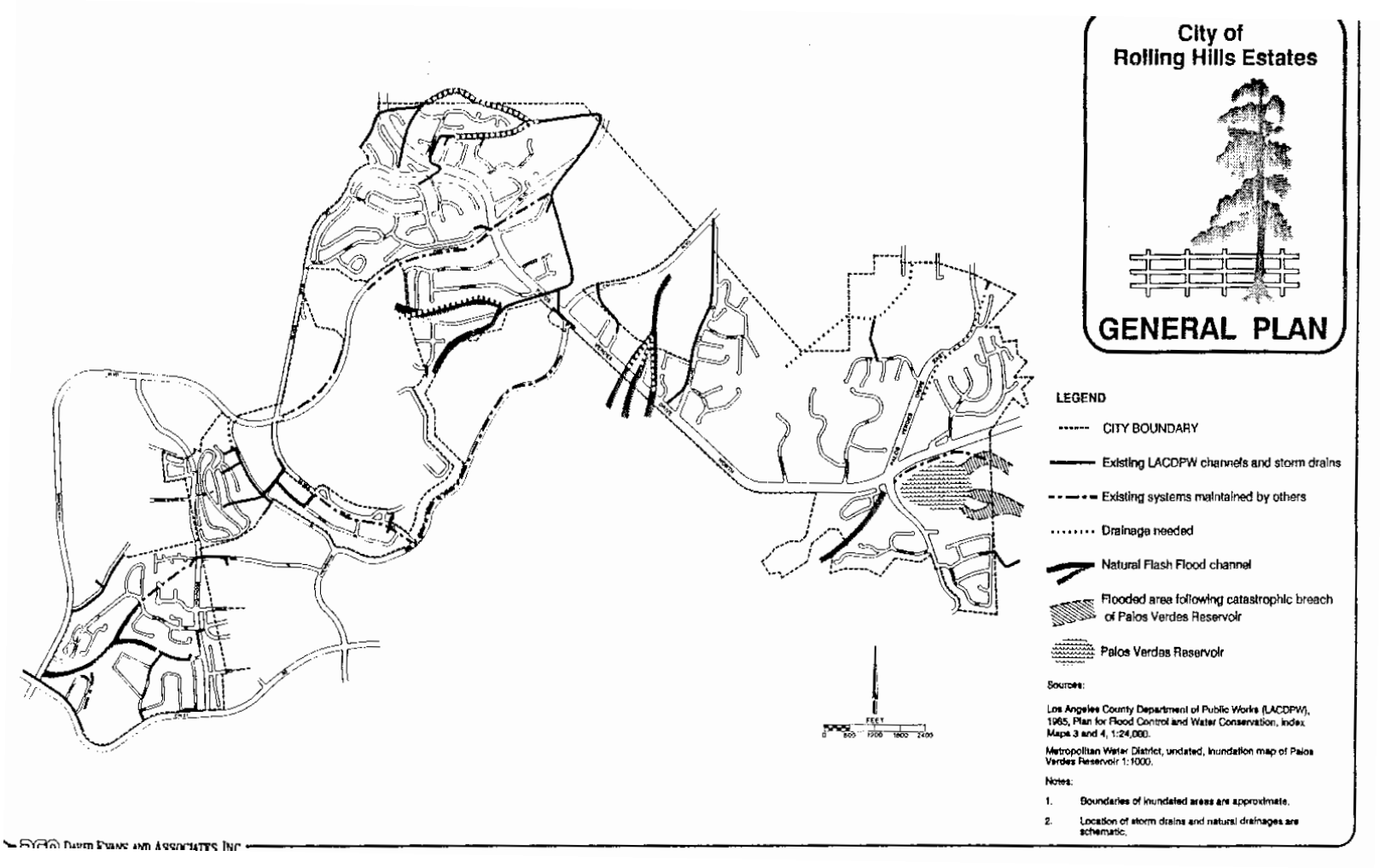
Because of the current design and construction practices and ongoing programs of review and modification, catastrophic dam failure is considered unlikely. However, it is expected that many flood control channels could suffer damage. Also, pumping stations in coastal communities are expected to fail due to liquefaction.

The Metropolitan Water District of Southern California owns and maintains the Palos Verdes Reservoir, located at the southeast corner of Palos Verdes Drive East and Palos Verdes Drive North. Although not a dam by definition, the reservoir poses a similar threat as a “dam”. The reservoir is constructed of steel reinforced concrete with earth-fill reinforcement banked around the perimeter and lined with an impervious rubber liner. It has an approximate capacity of 1,000 acre feet. A ravine leads from the west spill gate to an underground flood control channel following the natural terrain to the east through Green Hills Memorial Park. The Memorial Park is bordered by residential areas.

According to the RPV MHFP, the most populated residential streets affected by a sudden dam failure could be the following residential streets: Avenida Feliciano, Tarrassa, Alvesta, Bandra, Avenida Del Mesa, and Redondela. Western Avenue might be affected between John Montgomery Drive and Avenida Aprenda.

The RHE General Plan Safety Element states that dam failure is not a severe safety threat to the City of Rolling Hills Estates because only open space and a parking lot are in the inundation path.

Map 4-11: Palos Verdes Reservoir Inundation Area
(Source: Rolling Hills Estates General Plan)



Buildings

The built environment is susceptible to damage from earthquakes. Buildings that collapse can trap and bury people. Lives are at risk, and the cost to clean up the damages is great. In most California communities, including the planning area, some buildings were built before 1933 when building codes were not as strict. In addition, retrofitting is not required except under certain conditions and can be expensive. Therefore, the number of buildings at risk remains high. The California Seismic Safety Commission makes annual reports on the progress of the retrofitting of unreinforced masonry buildings. Fortunately, there are very few buildings in the planning area that were constructed prior to 1933. The bulk of development that has occurred in both Cities took place after World War II.

Because the planning area is comprised primarily of low and medium residential dwellings, it is anticipated that most dwellings would not suffer severe structural damage unless they are in an area of instable soil. However, the combination of severity and length of the shaking could still produce dramatic effects.

Infrastructure and Communication

Residents in the planning area commute frequently by automobiles and public transportation such as buses. An earthquake can greatly damage bridges and roads, hampering emergency response efforts and the normal movement of people and goods. Damaged infrastructure strongly affects the economy of the community because it disconnects people from work, school, food, and leisure, and separates businesses from their customers and suppliers.

Bridge Damage

Even modern bridges can sustain damage during earthquakes, leaving them unsafe for use. Some bridges have failed completely due to strong ground motion. Bridges are a vital transportation link - with even minor damages, making some areas inaccessible. Because bridges vary in size, materials, location and design, any given earthquake will affect them differently. Bridges built before the mid-1970' s have a significantly higher risk of suffering structural damage during a moderate to large earthquake compared with those built after 1980 when design improvements were made.

There are no bridges located within the planning area. However, there are several bridges that provide access to the planning area which are state, county or privately owned (including railroad bridges). Much of the interstate highway system was built in the mid to late 1960's. California Department of Transportation (Caltrans) has retrofitted most bridges on the freeway systems; however there are still some county maintained bridges that are not retrofitted. The FHWA requires that bridges on the National Bridge Inventory be inspected every 2 years. Caltrans checks when the bridges are inspected because they administer the Federal funds for bridge projects.

Damage to Lifelines

Lifelines are the connections between communities and outside services. They include water and gas lines, transportation systems, and electricity and communication networks. Ground shaking and amplification can cause pipes to break open, power lines to fall, roads and railways to crack or move, and radio and telephone communication to cease. Disruption to transportation makes it especially difficult to bring in supplies or services. Lifelines need to be

usable after earthquake to allow for rescue, recovery, and rebuilding efforts and to relay important information to the public.

Disruption of Critical Services

Critical facilities include police stations, fire stations, hospitals, shelters, and other facilities that provide important services to the community. According to the MHFP's for the planning area cities, severe shortages are projected for hospital beds, communications systems, electrical power, fire resources, natural gas, petroleum fuels, railroad services, sanitation systems, and water supply. These facilities and their services need to be functional after an earthquake event.

Businesses

Seismic activity can cause great loss to businesses, both large-scale corporations and small retail shops. When a company is forced to stop production for just a day, the economic loss can be tremendous, especially when its market is at a national or global level. Seismic activity can create economic loss that presents a burden to large and small shop owners who may have difficulty recovering from their losses.

Forty percent of businesses do not reopen after a disaster, and another twenty-five percent fail within one year, according to FEMA. Similar statistics from the United States Small Business Administration indicate that over ninety percent of businesses fail within two years after being struck by a disaster.

Of all businesses which close following a natural disaster, more than forty-three percent never reopen, and an additional twenty-nine percent close for good within the next two years.

Individual Preparedness

Because the potential for earthquake occurrences, and earthquake related property damage, is relatively high in Los Angeles County, increasing individual preparedness is a significant need. Strapping down heavy furniture, water heaters, and expensive personal property, as well as being earthquake-insured, and anchoring buildings to foundations, are just a few steps individuals can take to prepare for an earthquake.

Death and Injury

Death and injury can occur both inside and outside of buildings due to collapsed buildings, falling equipment, furniture, debris, and structural materials. Downed power lines and broken water and gas lines can also endanger human life.

Fire

Downed power lines or broken gas mains can trigger fires. When fire stations suffer building or lifeline damage, quick response to extinguish fires is less likely. Furthermore, major incidents demand a larger share of resources, and initially smaller fires and problems receive little or insufficient resources in the initial hours after a major earthquake event.

Loss of electricity may cause a loss of water pressure in some communities, further hampering firefighting ability.

Debris

After damage to a variety of structures, much time is spent cleaning up brick, glass, wood, steel or concrete building elements, office and home contents, and other materials. Developing a strong debris management strategy is essential in post-disaster recovery. Disasters do not exempt the Cities in the planning area from compliance with the state's AB 939 solid waste reduction regulations.

Existing Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are implemented by county, regional, state, or federal agencies or organizations.

City Codes

Implementation of earthquake mitigation policy most often takes place at the local government level. The City Building and Safety Departments enforce the following Uniform Building Codes pertaining to earthquake hazards:

1605.2.1 (Distribution of Horizontal Shear)
1605.2.2 (Stability against Overturning)
1626-1629 (Seismic)
1605.2.3 (Anchorage)

Both Cities have Planning Departments that enforce the zoning and land use regulations relating to earthquake hazards.

Generally, these codes seek to discourage development in areas that could be prone to flooding, landslide, wildfire and/or seismic hazards; and where development is permitted, that the applicable construction standards are met. Developers in hazard-prone areas may be required to retain a qualified professional engineer to evaluate level of risk on the site and recommend appropriate mitigation measures.

Coordination among Building Officials

The City Building Codes set the minimum design and construction standards for new buildings. In 2002 the City of Rancho Palos Verdes and the City of Rolling Hills Estates adopted the most recent seismic standards in its building code, which requires that new and remodeled buildings be built at a higher seismic standard.

Since November 8, 1987, the Cities have also required that site-specific seismic hazard investigations be performed for new essential facilities, major structures, hazardous facilities, and special occupancy structures such as schools, hospitals, and emergency response facilities.

Identify the Applicable Code Sections that Apply to Earthquake Hazard Mitigation

Generally, these codes seek to discourage development in areas that could be prone to flooding, landslide, wildfire and/or seismic hazards; and where development is permitted, that the applicable construction standards are met. Developers in hazard-prone areas may be required to retain a qualified professional engineer to evaluate level of risk on the site and recommend appropriate mitigation measures.

Businesses/Private Sector

Hazards have a devastating impact on businesses. In fact, of all businesses that close, following a disaster, forty percent never reopen, and an additional twenty-nine percent close for good within the next two years. The Institute of Business and Home Safety has developed "Open for Business," a disaster planning tool kit that helps guide businesses in preparing for, and dealing with, the adverse effects of hazards. The kit integrates protection from disasters into the company's risk reduction measures to safeguard employees, customers, and the investment itself. The guide helps businesses secure human and physical resources during disasters, and helps to develop strategies to maintain business continuity before, during, and after a disaster occurs.

Hospitals

"The Alfred E. Alquist Hospital Seismic Safety Act" ("Hospital Act") was enacted in 1973 in response to the moderate M6.6 Sylmar Earthquake in 1971 when four major hospital campuses were severely damaged and evacuated. Two hospital buildings collapsed killing forty-seven people. Three others were killed in another hospital that nearly collapsed.

In approving the Act, the Legislature noted that:

"Hospitals, that house patients who have less than the capacity of normally healthy persons to protect themselves, and that must be reasonably capable of providing services to the public after a disaster, shall be designed and constructed to resist, insofar as practical, the forces generated by earthquakes, gravity and winds." (Health and Safety Code Section 129680)

When the Hospital Act was passed in 1973, the State anticipated that, based on the regular and timely replacement of aging hospital facilities, the majority of hospital buildings would be in compliance with the Act's standards within 25 years. However, hospital buildings were not, and are not, being replaced at that anticipated rate. In fact, the great majority of the State's urgent care facilities are now more than 40 years old.

The moderate M6.7 Northridge Earthquake in 1994, caused $3 billion in hospital-related damage and evacuations. Twelve hospital buildings constructed before the Act were cited (red tagged) as unsafe for occupancy after the earthquake. Those hospitals that were built in accordance with the 1973 Hospital Act were very successful in resisting structural damage. However, nonstructural damage (for example, plumbing and ceiling systems) was extensive in those post-1973 buildings. Senate Bill 1953 (SB 1953), enacted in 1994 after the Northridge Earthquake, expanded the scope of the 1973 Hospital Act. Under SB 1953, all hospitals are required, as of January 1, 2008, to survive earthquakes without collapsing or posing the threat of significant loss of life. The 1994 Act further mandates that all existing hospitals be seismically evaluated, and retrofitted, if needed, by 2030, so that they are in substantial compliance with the Act (which requires that the hospital buildings be reasonably capable of providing services to

the public after disasters). SB 1953 applies to all urgent care facilities (including those built prior to the 1973 Hospital Act) and affects approximately 2,500 buildings on 475 campuses.

SB 1953 directed the Office of Statewide Health Planning and Development ("OSHPD"), in consultation with the Hospital Building Safety Board, to develop emergency regulations including "…earthquake performance categories with sub gradations for risk to life, structural soundness, building contents, and nonstructural systems that are critical to providing basic services to hospital inpatients and the public after a disaster." (Health and Safety Code Section 130005)

The Seismic Safety Commission Evaluation of the State's Hospital Seismic Safety Policies

In 2001, recognizing the continuing need to assess the adequacy of policies, and the application of advances in technical knowledge and understanding, the California Seismic Safety Commission created an Ad Hoc Committee to re-examine the compliance with the Alquist Hospital Seismic Safety Act. The formation of the Committee was also prompted by the recent evaluations of hospital buildings reported to OSHPD that revealed that a large percentage (40%) of California's operating hospitals are in the highest category of collapse risk.

California Earthquake Mitigation Legislation

California is painfully aware of the threats it faces from earthquakes. Dating back to the 19th century, Californians have been killed, injured, and lost property as a result of earthquakes. As the State's population continues to grow, and urban areas become even denser, the risk will continue to increase. For decades the Legislature has passed laws to strengthen the built environment and protect the residents.

Table 4-3: Sampling of Earthquake Laws in California (Source: http://www.leginfo.ca.gov/calaw.html)

Code Section	Description
Government Code Section 8870-8870.95	Creates Seismic Safety Commission.
Government Code Section 8876.1-8876.10	Established the California Center for Earthquake Engineering Research.
Public Resources Code Section 2800-2804.6	Authorized a prototype earthquake prediction system along the central San Andreas fault near the City of Parkfield.
Public Resources Code Section 2810-2815	Continued the Southern California Earthquake Preparedness Project and the Bay Area Regional Earthquake Preparedness Project.
Health and Safety Code Section 16100-16110	The Seismic Safety Commission and State Architect will develop a state policy on acceptable levels of earthquake risk for new and existing state-owned buildings.

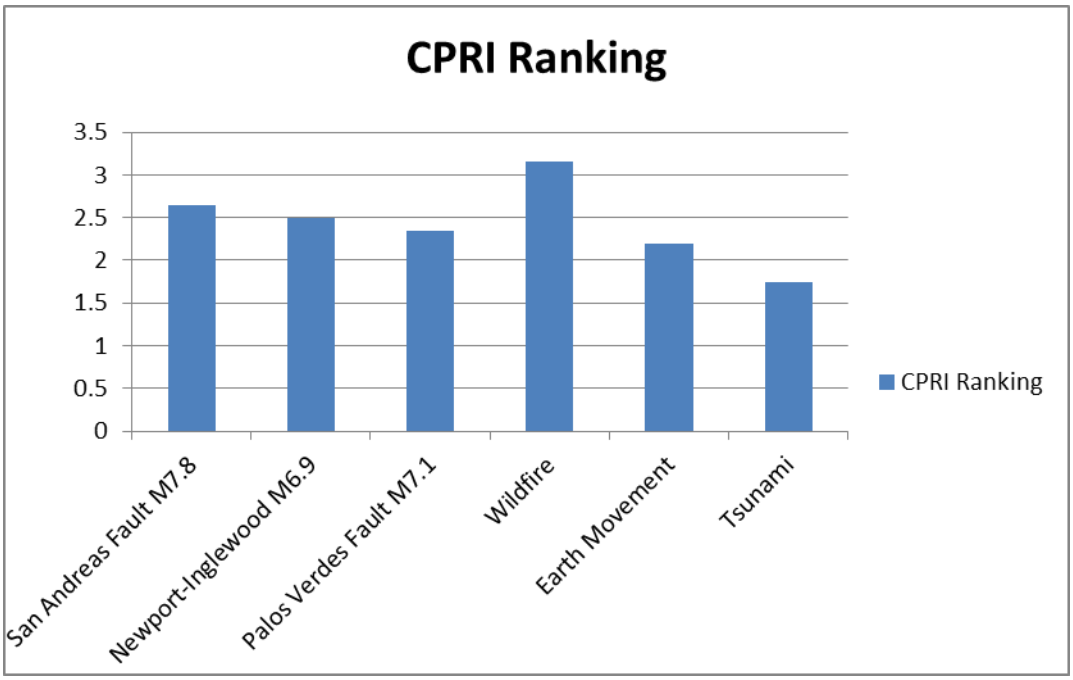
Table 4-3: Sampling of Earthquake Laws in California (Source: http://www.leginfo.ca.gov/calaw.html)

Code Section	Description
Government Code Section 8871-8871.5	Established the California Earthquake Hazards Reduction Act of 1986.
Health and Safety Code Section 130000-130025	Defined earthquake performance standards for hospitals.
Public Resources Code Section 2805-2808	Established the California Earthquake Education Project.
Government Code Section 8899.10-8899.16	Established the Earthquake Research Evaluation Conference.
Public Resources Code Section 2621-2630	Established the Alquist-Priolo Earthquake Fault Zoning Act.
Government Code Section 8878.50-8878.52	Created the Earthquake Safety and Public Buildings Rehabilitation Bond Act of 1990.
Education Code Section 35295-35297	Established emergency procedure systems in kindergarten through grade 12 in all the public or private schools.
Health and Safety Code Section 19160-19169	Established standards for seismic retrofitting of unreinforced masonry buildings.
Health and Safety Code Section 1596.80-1596.879	Required all child day care facilities to include an Earthquake Preparedness Checklist as an attachment to their disaster plan.

Earthquake Education

Earthquake research and education activities are conducted at several major universities in the Southern California region, including Cal Tech, USC, UCLA, UCI, and UCSB. The local clearinghouse for earthquake information is the Southern California Earthquake Center (SCEC) located at the University of Southern California, Los Angeles, CA 90089, Telephone: (213) 740-5843, Fax: (213) 740-0011, Email: SCEinfo@usc.edu, Website: http://www.scec.org. SCEC is a community of scientists and specialists who actively coordinate research on earthquake hazards at nine core institutions, and communicate earthquake information to the public. SCEC is a National Science Foundation (NSF) Science and Technology Center and is co-funded by the United States Geological Survey (USGS).

Section 5: Wildfire Hazards



Calculated Priority Risk Index (CPRI)	
Probability:	Likely
Magnitude/Severity:	Critical
Warning Time:	Less than 6 hours
Duration:	Less than one week

Why are Wildfires a Threat to the Planning Area?*

With its many steep canyons and open scrub-covered hillsides, the planning area has always been vulnerable to the hazards associated with brush fires. The earliest newspaper report of a wildfire on the Palos Verdes Peninsula was in October 1923, in which the Los Angeles Examiner reported a brush fire on the Palos Verdes Hills that burned an estimated 4,000 acres. Although no people were injured or killed and no structures were destroyed, a considerable amount of livestock perished in the fire, including 18 horses, 500 rabbits and an unspecified number of chickens. In September 1945, the Peninsula News reported on a grass fire near Crest Road (in probably what is now the City of Rolling Hills) that destroyed one home and caused an estimated $50,000 worth of property damage. In June 1967, the Peninsula News reported that 45 acres had burned in the Portuguese Bend area. Although no residences were

*** ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2**

B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))

damaged in this incident, “considerable farm land was destroyed as fire trucks and other equipment had to cross the fields in order to fight the flames.”

While hardly a year goes by when there isn’t at least one small brush fire in the planning area, by far the most destructive wildland fire to ravage the area to date occurred in June 1973. As reported in the Peninsula News, the fire was started accidentally on Friday, June 22, 1973 at approximately 2:30 PM by two youths playing with fireworks flash powder near the intersection of Whitley Collins Drive and Crenshaw Boulevard in Rancho Palos Verdes. An empty field at the time, this area has since been developed with housing (The Island View tract). The day was unusually warm, with temperatures in the 90’s and wind speeds of 10 to 20 miles per hour. Fueled by the gusting and shifting winds, the fire spread east to the federal radar dome facility at what is now Del Cerro Park, narrowly bypassed this facility and continued to move into the City of Rolling Hills, where it completely destroyed 9 homes. When the winds shifted to west, the fire burned into the Portuguese Bend area of Rancho Palos Verdes and destroyed 3 more homes. In all, the 1973 fire consumed a total of 900 acres and raged for 28 hours before it was finally extinguished. Fortunately, no human lives were lost. However, in addition to the 12 homes that were destroyed, the conflagration also damaged 12 other structures. All told, the disaster caused $1.3 million in private property damage in Rolling Hills and an additional $130,000 worth of damage in Rancho Palos Verdes. The Peninsula News also noted that the fire narrowly missed the Wayfarers Chapel, but did destroy several Edison power poles in McCarrell’s Canyon on the western margin of the fire. It appears that the Fire of 1973 is second only to the Portuguese Bend Landslide as the most devastating natural disaster that has ever befallen the planning area.

In urban areas, the effectiveness of fire protection efforts is based upon several factors, including the age of structures, efficiency of circulation routes that ultimately affect response times and availability of water resources to combat fires. In wildland areas, taking the proper precautions, such as the use of fire resistant building materials, a pro-active Fire Prevention inspection program, and the development of defensible space around structures where combustible vegetation is controlled, can protect developed lands from fires and, therefore, reduce the potential loss of life and property.

Other factors contribute to the severity of fires including weather and winds. Specifically, winds commonly referred to as Santa Ana winds, which occur during fire season (typically from June to the first significant rain in November) are particularly significant. Such “fire weather” is characterized by several days of hot dry weather and high winds, resulting in low fuel moisture in vegetation.

California experiences large, destructive wildland fires almost every year, and Los Angeles County is no exception. Wildland fires have occurred within the county, particularly in the fall of the year, ranging from small, localized fires to disastrous fires covering thousands of acres. The most severe fire protection problem in the area is wildland fire during Santa Ana wind conditions.

The planning area is considered to be a Severe Fire Hazard Zone according to the Los Angeles County Fire Department. The most recent fire hazard to affect the planning area was on January 9, 2012 when a brush fire burned approximately 15 acres in Rancho Palos Verdes. Fortunately, in recent history, the planning area has lost neither structures nor life to wildfires.

Why are Wildfires a Threat to California?

A wildfire is an uncontrolled fire spreading through vegetative fuels and exposing or possibly consuming structures. They often begin unnoticed and spread quickly. Naturally occurring and non-native species of grasses, brush, and trees fuel wildfires. A Wildland Fire is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. A Wildland/Urban Interface Fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels.

People start more than 80 percent of wildfires, usually as debris burns, arson, or carelessness. Lightning strikes are the next leading cause of wildfires. Wildfire behavior is based on three primary factors: fuel, topography, and weather. The type, and amount of fuel, as well as its burning qualities and level of moisture affect wildfire potential and behavior. The continuity of fuels, expressed in both horizontal and vertical components, is also a determinant of wildfire potential and behavior. Topography is important because it affects the movement of air (and thus the fire) over the ground surface. The slope and shape of terrain can change the speed at which the fire travels, and the ability of firefighters to reach and extinguish the fire. Weather affects the probability of wildfire and has a significant effect on its behavior. Temperature, humidity and wind (both short and long term) affect the severity and duration of wildfires. Los Angeles County's topography, consisting of a semi-arid coastal plain and rolling highlands, when fueled by shrub overgrowth, occasional Santa Ana winds and high temperatures, creates an ever-present threat of wildland fire. Extreme weather conditions such as high temperature, low humidity, and/or winds of extraordinary force may cause an ordinary fire to expand into one of massive proportions.

For thousands of years, fires have been a natural part of the ecosystem in Southern California. However, wildfires present a substantial hazard to life and property in communities built within or adjacent to hillsides and mountainous areas. There is a huge potential for losses due to wildland/urban interface fires in Southern California. According to the California Division of Forestry (CDF), there were over seven thousand reportable fires in California in 2003, with over one million acres burned. According to CDF statistics, in the October 2003 Firestorms, over 4,800 homes were destroyed and 22 lives were lost.

In late October 2007, Southern California experienced an unusually severe fire weather event characterized by intense, dry, gusty Santa Ana winds. This weather event drove a series of

destructive wildfires that took a devastating toll on people, property, natural resources, and infrastructure. Although some fires burned into early November, the heaviest damage occurred during the first three days of the siege when the winds were the strongest.

Historic Fires in Southern California

Large fires have been part of the Southern California landscape for millennia. Written documents reveal that during the 19th century human settlement of southern California altered the fire regime of coastal California by increasing the fire frequency. This was an era of very limited fire suppression, and yet like today, large crown fires covering tens of thousands of acres were not uncommon. One of the largest fires in Los Angeles County (60,000 acres) occurred in 1878.

Table 5-1: 20 Largest California Wildland Fires (By Acreage Burned)
(Source: CAL FIRE)

20 Largest California Wildland Fires (By *Acreage Burned)

	FIRE NAME/CAUSE	DATE	COUNTY	*ACRES*	STRUCTURES	DEATHS
1	CEDAR *(HUMAN)*	October 2003	SAN DIEGO	273,246	2,820	15
2	ZACA *(HUMAN)*	July 2007	SANTA BARBARA	240,207	1	0
3	MATILIJA *(UNDETERMINED)*	September 1932	VENTURA	220,000	0	0
4	WITCH *(POWERLINES)*	October 2007	SAN DIEGO	197,990	1,650	2
5	KLAMATH THEATER COMPLEX *(LIGHTNING)*	June 2008	SISKIYOU	192,038	0	2
6	MARBLE CONE *(LIGHTNING)*	July 1977	MONTEREY	177,866	0	0
7	LAGUNA *(POWERLINES)*	September 1970	SAN DIEGO	175,425	382	5
8	BASIN COMPLEX *(LIGHTNING)*	June 2008	MONTEREY	162,818	58	0
9	DAY FIRE *(HUMAN)*	September 2006	VENTURA	162,702	11	0
10	STATION FIRE *(HUMAN)*	August 2009	LOS ANGELES	160,557	209	2
11	MCNALLY *(HUMAN)*	July 2002	TULARE	150,696	17	0
12	STANISLAUS COMPLEX *(LIGHTNING)*	August 1987	TUOLUMNE	145,980	28	1
13	BIG BAR COMPLEX *(LIGHTNING)*	August 1999	TRINITY	140,948	0	0
14	CAMPBELL COMPLEX *(POWERLINES)*	August 1990	TEHAMA	125,892	27	0
15	WHEELER *(ARSON)*	July 1985	VENTURA	118,000	26	0
16	SIMI *(UNDER INVESTIGATION)*	October 2003	VENTURA	108,204	300	0
17	HWY. 58 *(VEHICLE)*	August 1996	SAN LUIS OBISPO	106,668	13	0
18	IRON ALPS COMPLEX *(LIGHTNING)*	June 2008	TRINITY	105,805	2	10
19	CLAMPITT *(POWERLINES)*	September 1970	LOS ANGELES	105,212	86	4
20	BAR COMPLEX *(LIGHTNING)*	July 2006	TRINITY	100,414	0	0

There is no doubt that there were fires with significant acreage loss in years prior to 1932, but those records are less reliable, and this list is meant to give an overview of the large acreage-loss fires in more recent times. (Also note that this list does not include fire jurisdiction. These are the top 20 within the state, regardless of whether they were state, federal, or local responsibility.)

9/28/2009

Table 5-2: 20 Largest California Wildland Fires (By Structures Destroyed)
(Source: CAL FIRE)

20 Largest California Wildland Fires (By Structures Destroyed)

	FIRE NAME/*CAUSE*	DATE	COUNTY	ACRES	*STRUCTURES*	DEATHS
1	TUNNEL *(REKINDLE)*	October 1991	ALAMEDA	1,600	2,900	25
2	CEDAR *(HUMAN)*	October 2003	SAN DIEGO	273,246	2,820	15
3	WITCH *(UNDER INVESTIGATION)*	October 2007	SAN DIEGO	197,990	1,650	2
4	OLD *(HUMAN)*	October 2003	SAN BERNARDINO	91,281	1,003	6
5	JONES *(UNDETERMINED)*	October 1999	SHASTA	26,200	954	1
6	PAINT *(ARSON)*	June 1990	SANTA BARBARA	4,900	641	1
7	FOUNTAIN *(ARSON)*	August 1992	SHASTA	63,960	636	0
8	SAYRE *(MISC)*	Novermber 2008	LOS ANGELES	11,262	604	0
9	CITY OF BERKELEY *(POWERLINES)*	September 1923	ALAMEDA	130	584	0
10	HARRIS *(UNDER INVESTIGATION)*	October 2007	SAN DIEGO	90,440	548	8
11	BEL AIR *(UNDETERMINED)*	November 1961	LOS ANGELES	6,090	484	0
12	LAGUNA FIRE *(ARSON)*	October 1993	ORANGE	14,437	441	0
13	LAGUNA *(POWERLINES)*	September 1970	SAN DIEGO	175,425	382	5
14	HUMBOLDT *(ARSON)*	June 2008	BUTTE	23,344	351	0
15	PANORAMA *(ARSON)*	November 1980	SAN BERNARDINO	23,600	325	4
16	TOPANGA *(ARSON)*	November 1993	LOS ANGELES	18,000	323	3
17	49ER *(BURNING DEBRIS)*	September 1988	NEVADA	33,700	312	0
18	ANGORA (HUMAN)	June 2007	EL DORADO	3,100	309	0
19	SIMI *(UNDER INVESTIGATION)*	October 2003	VENTURA	108,204	300	0
20	SLIDE *(UNDER INVESTIGATION)*	October 2007	SAN BERNARDINO	12,759	272	0

Note that this list does not include fire jurisdiction. These are the Top 20 within California, regardless of whether they were state, federal, or local responsibility. Also note that "structures" is meant to include all loss - homes and outbuildings, etc.

CAL FIRE

11/4/2009

Table 5-3: Acreage Burned in Los Angeles County 2004-2010

Year	Unincorporated Los Angeles County	Other Jurisdictions	All Jurisdictions
2004	34,353.58	361.80	34,715.38
2005	5,221.09	23,834.87	29,055.96
2006	7,355.35	163.66	7,519.01
2007	116,893.76	2,231.35	119,125.11
2008	30,714.17	401.92	31,116.09
2009	162,265.62	870.78	163,136.40
2010	1,513.99	45.02	1,559.01
Totals	**358,317.56**	**27,909.40**	**386,226.96**

Source: Los Angeles County Fire Department, Information Management Section, 2010.

Table 5-4: Los Angeles County Wildfire Incidents 2007-2010

Fire Name	Year	Acres Burned	Structures	
			Damaged	*Destroyed*
Buckweed/ Agua Dulce	2007	38,356	30	43
Canyon	2007	4,500	14	8
Magic	2007	2,824	0	0
Ranch	2007	58,401	2	10
Meadow Ridge	2007	20	0	0
October	2007	100	0	0
Sayre	2008	11,262	0	634
Sesnon	2008	14,703	11	78
Marek	2008	4,824	10	42
Osito	2009	304	0	0
Morris	2009	2,168	0	0
Station	2009	160,577	57	209
Crown	2010	14,000	6	10
Briggs	2010	530	0	0
Totals		**312,569**	**130**	**1,034**

Source: Cal Fire Fire Incident Reports

*Data on structures damaged and destroyed was not available for all wildfires, just for the ones listed above.

During the 2003 fire season, more than 6.9 million acres of public and private lands burned in the U.S., resulting in loss of property, damage to resources, and disruption of community services. Taxpayers spent more than $1.6 billion to combat more than 88,400 fires nationwide. Many of these fires burned in wildland/urban interface areas and exceeded the fire suppression capabilities of those areas. Table 5-5: National Fire Suppression Costs illustrates fire suppression costs for state, private and federal lands.

Table 5-5: National Fire Suppression Costs
(Source: http://research.yale.edu/gisf/assets/pdf/ppf/wildfire_report.pdf)

Year	Suppression Costs	Acres Burned	Structures Burned
2000	$1.3 billion	8,422,237	861
2001	$0.5 billion	3,570,911	731
2002	$1.6 billion	6,937,584	815

The 2003 Southern California Fires

The fall of 2003 marked the most destructive wildfire season in California history. In a ten day period, 12 separate fires raged across Southern California in Los Angeles, Riverside, San Bernardino, San Diego, and Ventura counties. The massive "Cedar Fire" in San Diego County alone consumed 2,800 homes and burned over a quarter of a million acres.

In October 2003, Southern California experienced the most devastating wildland fire disaster in state history. Over 739,597 acres burned; 3,631 homes, 36 commercial properties, and 1,169 outbuildings were destroyed; 246 people were injured; and 24 people died, including one firefighter. At the height of the siege, 15,631 personnel were assigned to fight the fires. (Source: State of California, *Governor's Blue Ribbon Panel Fire Commission Report to the Governor*, 2004)

The 2007 Southern California Fires

In late October 2007, Southern California experienced an unusually severe fire weather event characterized by intense, dry, gusty Santa Ana winds. This weather event drove a series of destructive wildfires that took a devastating toll on people, property, natural resources, and infrastructure. Although some fires burned into early November, the heaviest damage occurred during the first three days of the siege when the winds were the strongest. During this siege, 17 people lost their lives, ten were killed by the fires outright, three were killed while evacuating, four died from other fire siege related causes, and 140 firefighters, and an unknown number of civilians were injured. A total of 3,069 homes and other buildings were destroyed, and hundreds more were damaged. Hundreds of thousands of people were evacuated at the height of the siege. The fires burned over half a million acres, including populated areas, wildlife habitat and watershed. Portions of the electrical power distribution network, telecommunications systems, and even some community water sources were destroyed. Transportation was disrupted over a large area for several days, including numerous road closures. Both the Governor of California and the President of the United States personally toured the ongoing fires. Governor Schwarzenegger proclaimed a state of emergency in seven counties before the end of the first day. President Bush quickly declared a major disaster. While the total impact of the 2007 fire siege was less than the disastrous fires of 2003, it was unquestionably one of the most devastating wildfire events in the history of California. (Source: http://www.fire.ca.gov/fire_protection/downloads/siege/2007/Overview_Introduction.pdf)

CAL FIRE 2010 Wildland Fire Summary

	Number of Fires	Acres Burned
2010	**2,961**	**23,191**
2009	**3,546**	**73,098**
5 Yr. Avg. *(2005-2009)*	**4,765**	**228,609**

These figures include fires and acres burned within CAL FIRE jurisdiction of State Responsibility Area

Fire Suppression Cost (Split over two fiscal years):
Fiscal Year July 2009- June 2010: $274+ million
Fiscal Year July 2010 - June 2011: (estimated) $51 million

Dollar Damage Costs: $5.2 million

Structures Destroyed*: 94 destroyed

Top Five Fires in Acreage Burned**

Fire	Start	Contained	County	**Acres**	Structures Destroyed	Cause
Bull	7/26	8/10	Kern	**16,442**	14	Miscellaneous
Crown	7/29	8/03	Los Angeles	**14,000**	10	Undermined
Canyon	9/12	9/19	Kern	**9,820**	1	Undermined
McDonald	7/27	8/02	Lassen	**9,408**	0	Lightning
Aliso	7/13	7/15	San Diego	**3,225**	0	Miscellaneous

Top Five Fires in Structures Destroyed**

Fire	Start	Contained	County	Acres	**Structures Destroyed**	Cause
West	7/27	8/06	Kern	1,650	**50**	Equipment Used
Bull	7/26	8/10	Kern	16,442	**14**	Miscellaneous
Crown	7/29	8/03	Los Angeles	14,000	**10**	Undermined
Canyon	9/12	9/19	Kern	9,820	**1**	Undermined
Metzen	5/15	5/15	Kern	360	**1**	Miscellaneous

*These are structures destroyed on major incidents and may not include structures destroyed on initial attack fires.

**These fires are the top five fires in the state, regardless of whether they were state, federal, or local responsibility.

Fire statistics provided by CAL FIRE - Office of the State Fire Marshal, CAIRS Section, using the CAIRS database and Wildfire Activity Statistics.

Sept. 2011
www.fire.ca.gov

Wildfire Characteristics

There are three categories wildland/urban interface fire: The classic wildland/urban interface exists where well-defined urban and suburban development presses up against open expanses of wildland areas; the mixed wildland/urban interface is characterized by isolated homes, subdivisions, and small communities situated predominantly in wildland settings. The occluded wildland/urban interface exists where islands of wildland vegetation occur inside a largely urbanized area. Certain conditions must be present for significant interface fires to occur. The most common conditions include: hot, dry and windy weather; the inability of fire protection forces to contain or suppress the fire; the occurrence of multiple fires that overwhelm committed resources; and a large fuel load (dense vegetation). Once a fire has started, several conditions influence its behavior, including fuel topography, weather, drought, and development.

Southern California has two distinct areas of risk for wildland fire. The foothills and lower mountain areas are most often covered with scrub brush or chaparral. The higher elevations of mountains also have heavily forested terrain. The lower elevations covered with chaparral create one type of exposure.

The higher elevations of Southern California's mountains are typically heavily forested. The magnitude of the 2003 fires is the result of three primary factors: 1) severe drought, accompanied by a series of storms that produce thousands of lightning strikes and windy conditions; 2) an infestation of bark beetles that has killed thousands of mature trees; and 3) the effects of wildfire suppression over the past century that has led to buildup of brush and small diameter trees in the forests.

"When Lewis and Clark explored the Northwest, the forests were relatively open, with 20 to 25 mature trees per acre. Periodically, lightning would start fires that would clear out underbrush and small trees, renewing the forests. Today's forests are completely different, with as many as 400 trees crowded onto each acre, along with thick undergrowth. This density of growth makes forests susceptible to disease, drought and, severe wildfires. Instead of restoring forests, these wildfires destroy them and it can take decades to recover. This radical change in our forests is the result of nearly a century of well-intentioned but misguided management." (Source: Overgrown Forests Require Preventive Measures, By Gale A. Norton (Secretary of the Interior), USA Today Editorial, August 21, 2002)

The Interface

One challenge Southern California faces regarding the wildfire hazard is from the increasing number of houses being built on the urban/wildland interface. Every year the growing population expands further into the hills and mountains, including forest lands. The increased "interface" between urban/suburban areas, and the open spaces created by this expansion, produces a significant increase in threats to life and property from fires, and pushes existing fire protection systems beyond original or current design and capability. Property owners in the interface are not aware of the problems and fire hazards or risks on their own property. Furthermore, human activities increase the incidence of fire ignition and potential damage.

Fuel

Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel is classified by volume and by type. Volume is described in terms of "fuel loading," or the amount of available vegetative fuel.

The type of fuel also influences wildfire. Chaparral is a primary fuel of Southern California wildfires. Chaparral habitat ranges in elevation from near sea level to over 5,000' in Southern California. Chaparral communities experience long dry summers and receive most of their annual precipitation from winter rains. Although chaparral is often considered as a single species, there are two distinct types; hard chaparral and soft chaparral. Within these two types are dozens of different plants, each with its own particular characteristics.

“Fire has been important in the life cycle of chaparral communities for over 2 million years; however, the true nature of the "fire cycle" has been subject to interpretation. In a period of 750 years, it generally thought that fire occurs once every 65 years in coastal drainages and once every 30 to 35 years inland.”

“The vegetation of chaparral communities has evolved to a point it requires fire to spawn regeneration. Many species invite fire through the production of plant materials with large surface-to-volume ratios, volatile oils, and through periodic die-back of vegetation. These species have further adapted to possess special reproductive mechanisms following fire. Several species produce vast quantities of seeds which lie dormant until fire triggers germination. The parent plant which produces these seeds defends itself from fire by a thick layer of bark which allows enough of the plant to survive so that the plant can crown sprout following the blaze. In general, chaparral community plants have adapted to fire through the following methods: a) fire induced flowering; b) bud production and sprouting subsequent to fire; and c) in-soil seed storage and fire stimulated germination; and d) on plant seed storage and fire stimulated dispersal.”

An important element in understanding the danger of wildfire is the availability of diverse fuels in the landscape, such as natural vegetation, manmade structures and combustible materials. A house surrounded by brushy growth rather than cleared space allows for greater continuity of fuel and increases the fire’s ability to spread. After decades of fire suppression “dog-hair” thickets have accumulated, which enable high intensity fires to flare and spread rapidly.

Topography

Topography influences the movement of air, thereby directing a fire course. For example, if the percentage of uphill slope doubles, the rate of spread in wildfire will likely double. Gulches and canyons can funnel air and act as chimneys, which intensify fire behavior and cause the fire to spread faster. Solar heating of dry, south-facing slopes produces up slope drafts that can

complicate fire behavior. Unfortunately, hillsides with hazardous topographic characteristics are also desirable residential areas in many communities. This underscores the need for wildfire hazard mitigation and increased education and outreach to homeowners living in interface areas.

Weather

Weather patterns combined with certain geographic locations can create a favorable climate for wildfire activity. Areas where annual precipitation is less than 30 inches per year are extremely fire susceptible. High-risk areas in Southern California share a hot, dry season in late summer and early fall when high temperatures and low humidity favor fire activity. The so-called "Santa Ana" winds, which are heated by compression as they flow down to Southern California from Utah, create a particularly high risk, as they can rapidly spread what might otherwise be a small fire.

Drought

Recent concerns about the effects of climate change, particularly drought, are contributing to concerns about wildfire vulnerability. The term 'drought' is applied to a period in which an unusual scarcity of rain causes a serious hydrological imbalance. Unusually dry winters, or significantly less rainfall than normal, can lead to relatively drier conditions and leave reservoirs and water tables lower. Drought leads to problems with irrigation and contributes to additional fires, or increased difficulty in fighting fires.

Development

Growth and development in scrubland and forested areas is increasing the number of human-caused structures in Southern California interface areas. Wildfire affects development, yet development can also influence wildfire. Owners often prefer homes that are private with scenic views, nestled in vegetation, and use natural materials. A private setting is usually far from public roads, or hidden behind a narrow, curving driveway. These conditions, however, make evacuation and firefighting difficult. The scenic views found along mountain ridges can also mean areas of dangerous topography. Natural vegetation contributes to scenic beauty, but it may also provide a ready trail of fuel leading a fire directly to the combustible fuels of the home itself.

Wildfire Hazard Assessment

Hazard Identification

Extreme weather conditions such as high temperature, low humidity, and/or winds of extraordinary force causes an ordinary fire to expand into one of massive proportions.

Wildfire hazard areas are commonly identified in regions of the wildland/urban interface. Ranges of the wildfire hazard are further determined by the ease of fire ignition due to natural or human conditions and the difficulty of fire suppression. The wildfire hazard is also magnified by several factors related to fire suppression/control such as the surrounding fuel load, weather, topography, and property characteristics.

Generally, hazard identification rating systems are based on weighted factors of fuels, weather and topography. In order to determine the "base hazard factor" of specific wildfire hazard sites and interface regions, several factors must be taken into account. Categories used to assess the base hazard factor include:

- ✓ Topographic location, characteristics and fuels
- ✓ Site/building construction and design
- ✓ Site/region fuel profile (landscaping)
- ✓ Defensible space
- ✓ Accessibility
- ✓ Fire protection response
- ✓ Water availability

Risk Analysis

Southern California residents are served by a variety of local fire departments as well as county, state and federal fire resources. Data that includes the location of interface areas in the county can be used to assess the population and total value of property at risk from wildfire and direct these fire agencies in fire prevention and response.

Key factors included in assessing wildfire risk include ignition sources, building materials and design, structural density, slope, vegetative fuel, fire occurrence and weather, as well as occurrences of drought.

The National Wildland/Urban Fire Protection Program has developed the Wildland/Urban Fire Hazard Assessment Methodology tool for communities to assess their risk to wildfire. For more information on wildfire hazard assessment refer to http://www.Firewise.org.

Fire hazards of concern in the planning area are those associated with structures and brush, as well as earthquake induced fires. Fire potential is typically greatest in the months of August, September, and October, when dry vegetation, combined with offshore dry Santa Ana winds, create a high potential for spontaneous fires. The hillsides and steep slopes facilitate rapid fire spread.

Local Conditions

Fire hazards threaten lives, property, and natural resources, and impact vegetation and wildlife habitats.

Weather

Weather conditions have many complex and important effects on fire intensity and behavior. Wind is of prime importance; as wind increases in velocity, the rate of fire spread also increases. Relative humidity (i.e., relative dryness of the air) also has a direct effect, the drier the air, and the drier the vegetation; the more likely the vegetation will ignite and burn. Precipitation (annual total, seasonal distribution and storm intensity) further affects the moisture content of dead and living vegetation, which influences fire ignition and behavior.

In addition to winds, structural development within or adjacent to wildland exposures represents an extreme fire protection problem due to flying embers and the predominance of combustible roof coverings.

Topography

Topography affects wildland fire behavior, and the ability of firefighters and their equipment to take action to suppress those fires. One example is a fire starting in the bottom of a canyon may expand quickly to the ridge top before initial attack forces can arrive. Rough topography greatly limits road construction, road standards, and accessibility by ground equipment. Steep topography also channels airflow, creating extremely erratic winds on lee slopes and in canyons. Water supply for fire protection to structures at higher elevations is frequently dependent on pumping units. The source of power for such units is usually from overhead distribution lines, which are subject to destruction by wildland fires.

Vegetation

A key to effective fire control and the successful accommodation of fire in wildland management is the understanding of fire and its environment. Fire environment is the complex of fuel, topographic, and air mass factors, that influence the inception, growth, and behavior of a fire. The topography and weather components are, for all practical purposes, beyond man's control, but it is a different story with fuels, which can be controlled before the outbreak of fires. In terms of future urban expansion, finding new ways to control and understand these fuels can lead to possible fire reduction.

Of these different vegetation types, coastal sage scrub, chaparral, and grasslands reach some degree of flammability during the dry summer months and, under certain conditions, during the winter months. For example, as chaparral gets older, twigs and branches within the plants die and are held in place. A stand of brush 10 to 20-years of age usually has enough dead material to produce rates of spread about the same as in grass fires when the fuels have dried out. In severe drought years, additional plant material may die, contributing to the fuel load. There will normally be enough dead fuel accumulated in 20 to 30-year old brush to give rates of spread about twice as fast as in a grass fire. Under moderate weather conditions that produce a spread rate of one-half foot per second in grass, a 20 to 30-year old stand of chaparral may have a rate of fire spread of about one foot per second. Fire spread in old brush (40 years or older) has been measured at eight times as fast as in grass, about four feet per second. Under extreme weather conditions, the fastest fire spread in grass is 12 feet per second or about eight miles per hour.

Community Wildfire Issues

What is Susceptible to Wildfires?

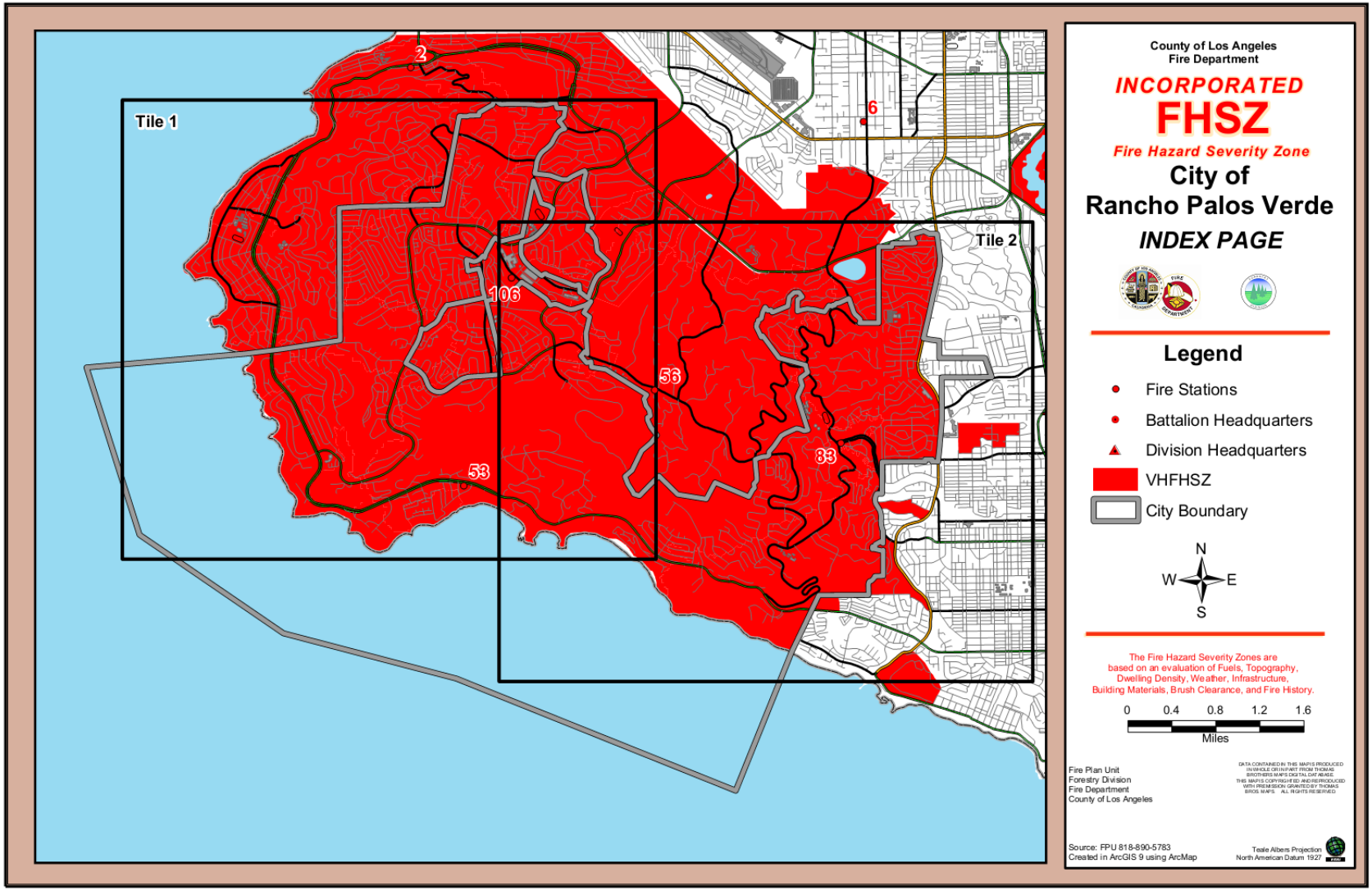
The planning area has identified properties within Very High Fire Hazard Severity Zones as shown in Maps 5-1 through 5-4 Defensible space can be created around structures by taking precautionary measures such as: 1) thinning trees and brush within a minimum of 30-feet of any structure or 50-feet of any structure in areas determined to be high hazard, 2) beyond 30-feet, remove dead wood, debris and low tree branches, 3) keeping lawns trimmed, leaves raked, and the roof and rain-gutters free from debris such as dead limbs and leaves, 4) stacking firewood at

least 30-feet away from a home, and 5) storing flammable materials, liquids and solvents in metal containers outside the home at least 30-feet away from structures and wooden fences.

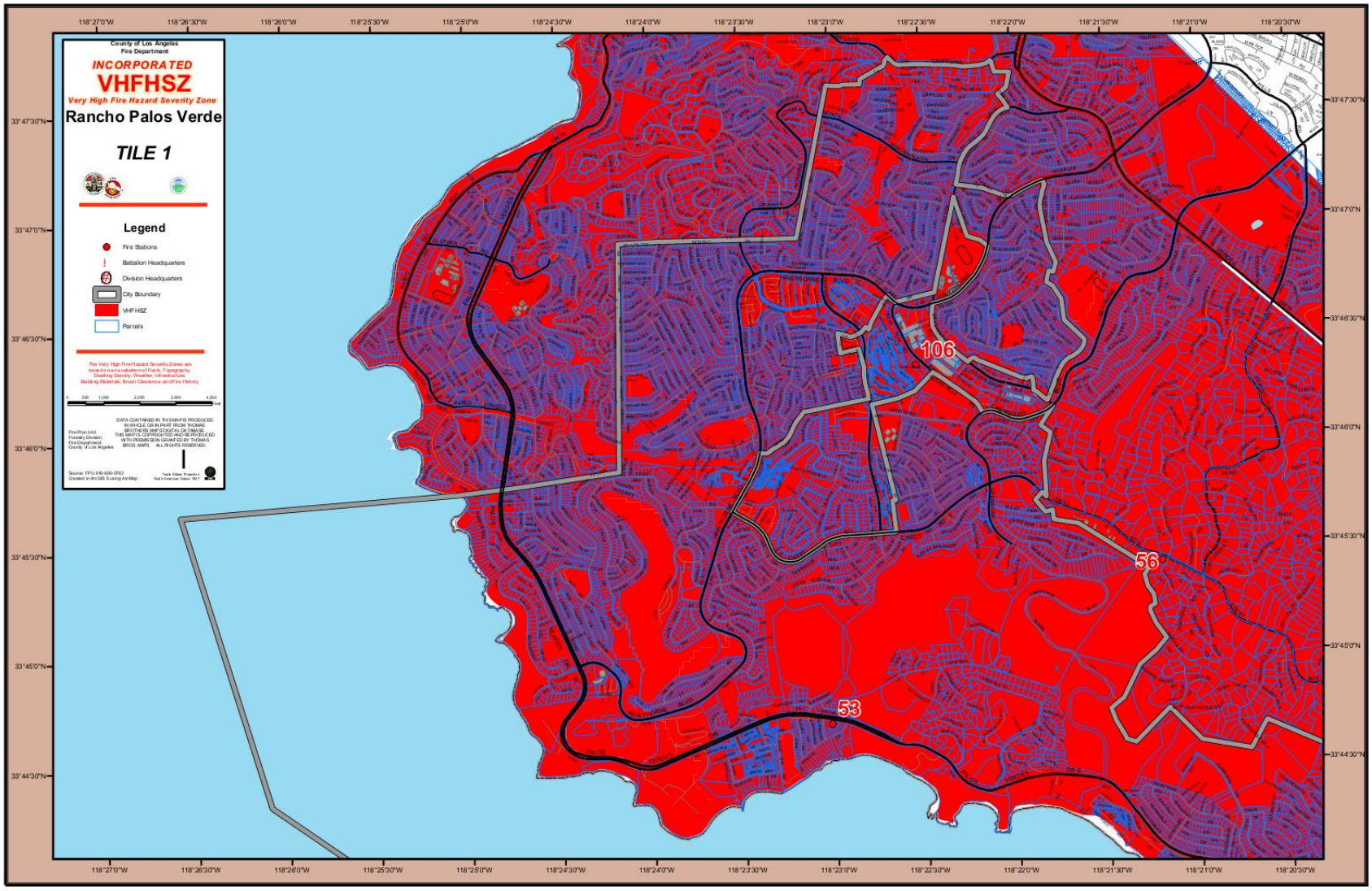
In the planning area, this scenario highlights the need for fire mitigation activity in all sectors of the region, wildland/urban interface or not. Examples of actions homeowners can take to mitigate fires include:

- ✓ Define a defensible space of a 30-foot non-combustible buffer area around the house and/or 50-foot in areas determined to be high hazard
- ✓ Reduce flammable vegetation, trees, and brush around the house
- ✓ Remove or prune trees
- ✓ Cut grass and weeds regularly
- ✓ Relocate wood piles and leftover materials
- ✓ Keep the area clean
- ✓ Install fire resistant roofing materials, spark arrestors on chimneys, and screen vents in eaves and decorative cornices

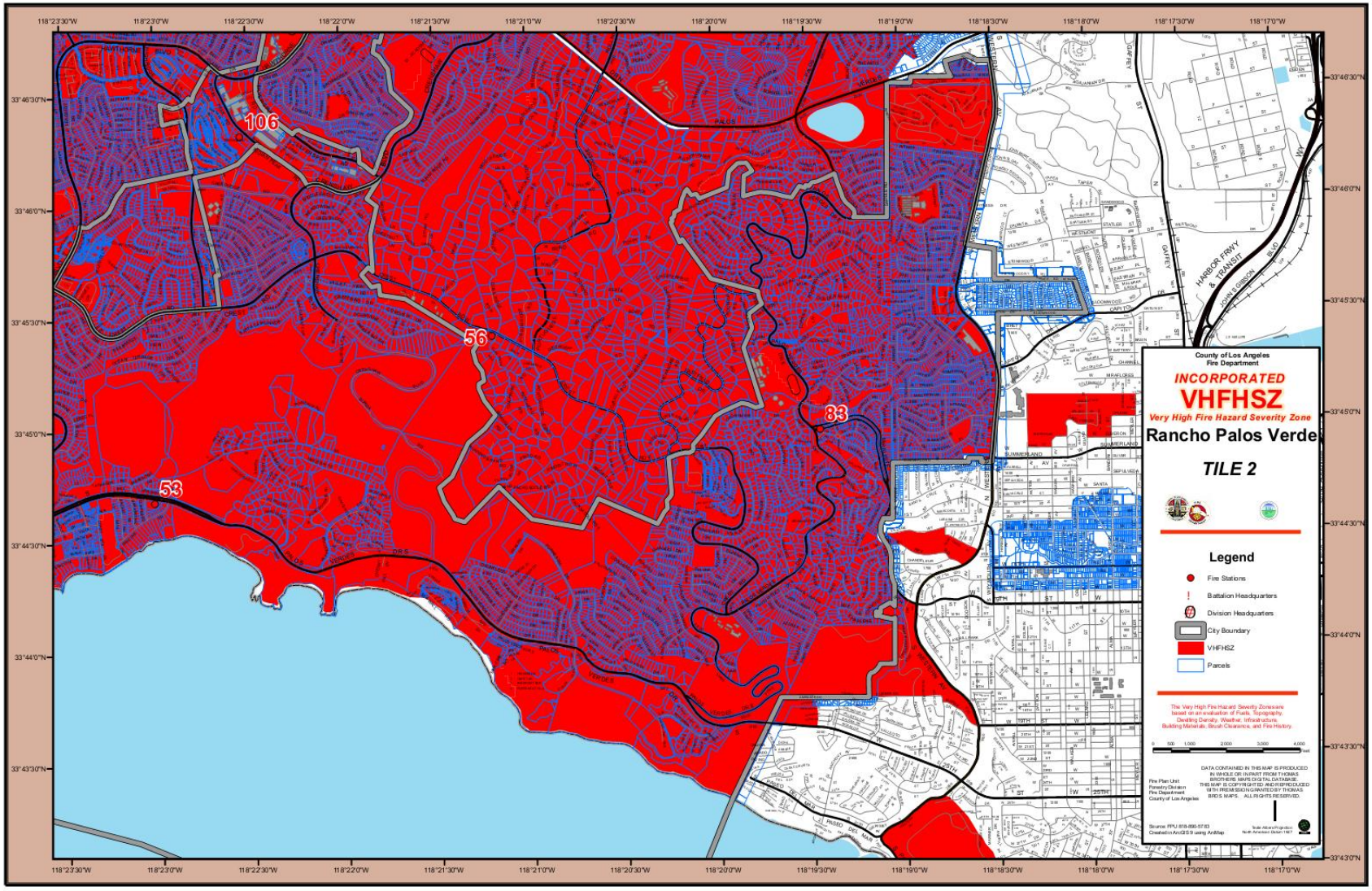
Map 5-1: City of RPV- Very High Fire Hazard Severity Zones: Index
(Source: County of Los Angeles Fire Department)



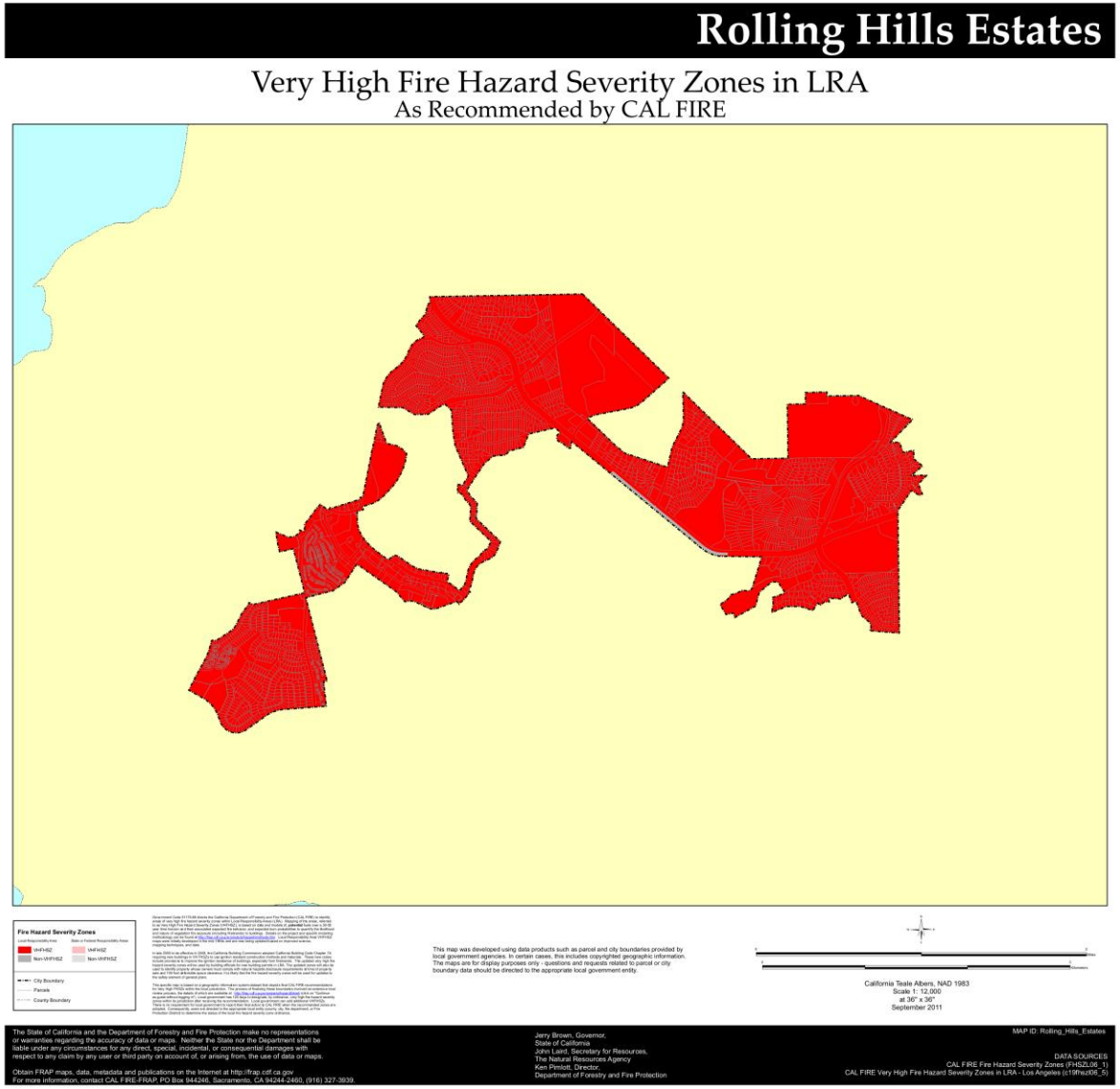
Map 5-2: City of RPV-Very High Fire Hazard Severity Zones: Tile 1
(Source: County of Los Angeles Fire Department)



Map 5-3: City of RPV- Very High Fire Hazard Severity Zones: Tile 2
(Source: County of Los Angeles Fire Department)



Map 5-4: City of RHE- Very High Fire Hazard Severity Zones
(Source: ftp://frap.cdf.ca.gov/fhszlocalmaps/los_angeles/rolling_hills_estates.pdf)



Impact of Wildfires in the Planning Area*

Wildfires and their impact varies by location and severity of any given wildfire event, and will likely only affect certain areas of the county during specific times. Based on the risk assessment, it is evident that wildfires will have potentially devastating economic impact to certain areas of the planning area. Impact that is not quantified, but can be anticipated in future events, includes:

- ✓ Injury and loss of life
- ✓ Commercial and residential structural damage
- ✓ Disruption of and damage to public infrastructure
- ✓ Secondary health hazards e.g. mold and mildew
- ✓ Damage to roads/bridges resulting in loss of mobility
- ✓ Significant economic impact (jobs, sales, tax revenue) upon the community
- ✓ Negative impact on commercial and residential property values
- ✓ Significant disruption to students and teachers as temporary facilities and relocations would likely be needed

Severity

The primary effects of fire, such as loss of life, injury, destruction of buildings and wildlife, are generally well known. Fire also has a number of secondary effects, such as strained public utilities, depleted water supplies, downed power lines, disrupted telephone systems, and closed roads. In addition, flood control facilities are overtaxed by the increased flow from bare hillsides, and the resulting debris that washes down. Affected recreation areas may have to close or restrict operations. Moreover, buildings destroyed by fire are usually eligible for property tax reassessment, which reduces revenue to local government.

A fire is usually extinguished within a few days, but its effects last much longer. Grassland re-sprouts the following spring, a chaparral community regenerate in three to five years, and oak woodland with most of its seedlings and saplings destroyed will start a new crop within five to ten years. Coniferous timber stands are most susceptible to long-term damage, taking as much as 50 to 100 years to re-establish a forest.

Fire destroys surface vegetation, leaving the soil bare and subject to erosion, when the rains begin in the fall and winter. Raindrops hit the surface with undiminished impact, splashing particles of soil loose that move downhill and are carried away by running water. Fire also destroys most of the roots that hold the soil in place, allowing running water to wash the soil away. Mudslides and mudflows can result from these processes.

Growth and Development in the Interface

The hills and mountainous areas of Southern California are considered to be interface areas. The development of homes and other structures is encroaching onto the wildlands and is

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*** ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3**

B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))

expanding the wildland/urban interface. The interface neighborhoods are characterized by a diverse mixture of varying housing structures, development patterns, ornamental and natural vegetation, and natural fuels.

In the event of a wildfire, vegetation, structures, and other flammables can merge into unwieldy and unpredictable events. Factors important to the fighting of such fires include access, firebreaks, proximity of water sources, distance from a fire station, and available firefighting personnel and equipment. Reviewing past wildland/urban interface fires shows that many structures are destroyed or damaged for one or more of the following reasons:

- ✓ Combustible roofing material
- ✓ Wood construction
- ✓ Structures with no defensible space
- ✓ Fire department has poor access to structures
- ✓ Subdivisions located in heavy natural fuel types
- ✓ Structures located on steep slopes covered with flammable vegetation
- ✓ Limited water supply
- ✓ Winds over 30 miles per hour

Road Access

Road access is a major issue for all emergency service providers. As development encroaches into the rural areas of the county, the number of houses without adequate turn-around space is increasing. In many areas, there is not adequate space for emergency vehicle turnarounds in single-family residential neighborhoods, obstructing emergency workers because they cannot access houses. Fire trucks are large, and firefighters are challenged by narrow roads and limited access. When there is inadequate turn around space, the fire fighters can only work to remove the occupants, but cannot safely remain to save the threatened structures.

Water Supply

Fire fighters in remote and rural areas are faced by limited water supply and lack of hydrant taps. Rural areas are characteristically outfitted with small diameter pipe water systems, inadequate for providing sustained firefighting flows.

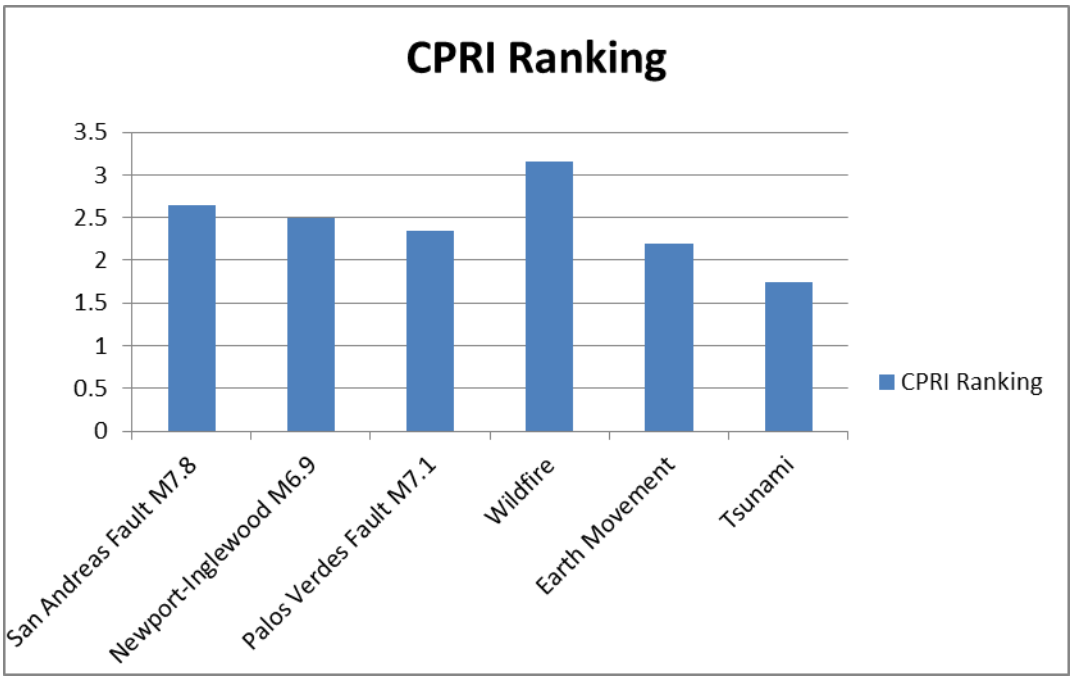
Interface Fire Education Programs and Enforcement

Fire protection in urban/wildland interface areas may rely heavily more on the landowner's personal initiative to take measures to protect his or her own property. Therefore, public education and awareness plays a greater role in interface areas. In those areas with strict fire codes, property owners who resist maintaining the minimum brush clearances can be cited for failure to clear brush.

Need for Mitigation Programs

Continued development into the interface areas has growing impact on the wildland/urban interface. Periodically, the historical losses from wildfires in Southern California are catastrophic, with historical deadly and expensive fires. The continued growth and development increases the public need for mitigation planning in Southern California.

Section 6: Earth Movement Hazards (Landslide & Debris Flow)



Calculated Priority Risk Index (CPRI)	
Probability:	Possible
Magnitude/Severity:	Limited
Warning Time:	Less than 6 hours
Duration:	Less than 6 hours

Why are Landslides a Threat to the Planning Area?*

Landslides are a serious geologic hazard in almost every state in America. Nationally, landslides cause 25 to 50 deaths each year. The best estimate of direct and indirect costs of landslide damage in the United States range between $1 and $2 billion annually. As a seismically active region, California has a significant number of locations impacted by landslides. Some landslides result in private property damage; other landslides impact transportation corridors, fuel and energy conduits, and communication facilities. They can also pose a serious threat to human life.

Landslides can be broken down into two categories: 1) rapidly moving (generally known as debris flows), and; 2) slow moving. Rapidly moving landslides or debris flows present the

* **ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2**
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))

greatest risk to human life, and people living in or traveling through areas prone to rapidly moving landslides, are at increased risk of serious injury. Slow moving landslides can cause significant property damage, but are less likely to result in serious human injuries.

Landslides/mudslides can cause abrupt depression and lateral displacement of hillside surfaces over distances of up to several hundreds of feet, disruption of surface drainage, blockage of flood control channels and roadways and displacement or destruction of improvements such as roadways, buildings, and water wells.

The primary effects of mudslides/landslides include: abrupt depression and lateral displacement of hillside surfaces over distances of up to several hundreds of feet, disruption of surface drainage, blockage of flood control channels and roadways, displacement or destruction of improvements such as roadways, buildings, and water wells.

In terms of avoiding the hazards of earth movement, the planning area has been far less fortunate. Although geologic maps of the Palos Verdes Peninsula made in the 1930's and published in 1946 clearly depict several ancient landslides, they were apparently not considered or discounted in later construction activities (Woodring, W.P., N. Bramlette and W.S.W. Kew: Geology and Paleontology of the Palos Verdes Hills, Geologic Survey Professional Paper 207, U.S. Department of the Interior, 1946).

The first and largest landslide to occur in the planning area was the Portuguese Bend Landslide. The slide area encompasses approximately 270 acres. The weight of the moving material is estimated to be about 60 million tons, with a maximum thickness calculated to be 250 feet. The slide began in August 1956 in conjunction with a County roadway project to extend Crenshaw Boulevard from Crest Road to Palos Verdes Drive South. Initially, movement was 3 to 4 inches per day, quickly slowing to 1 inch per day a month later. The reactivation of this ancient landslide resulted in the loss of 134 residential dwellings, which were damaged beyond repair and razed. Relocation to safer ground saved a few homes. (The Palos Verdes Peninsula: A Geologic Guide and More, by Martin Reiter, Kendall/Hunt Publishing Company, 1984) The slide also destroyed the Portuguese Bend Beach Club (Reiter, 1984), a private recreational facility that included a large clubhouse, saltwater pool, boating pier, tennis courts, and volleyball courts (PV News, 1948 & 1952). Between 1962 and 1970, movement slowed to ½ inch per day (Reiter, 1984). Today, movement is approximately 3 feet per year, depending on the amount of rainfall the previous season. Nearly all of the remaining homes in the active slide area have been placed on elevated or so-called "floating" foundations that can be adjusted as the earth continues to slowly move and buckle beneath the homes.

Reactivation of the 80-acre Abalone Cove Landslide was first noted at the shoreline in February 1974. At the time, Abalone Cove was a private beach club. Slow movement continued between the shoreline and Palos Verdes Drive South until 1978, but only impacted vacant land. In late April or early May 1978, following one of the rainiest seasons on record (29.61 inches fell during 1977-78 compared to an average annual rainfall of 11.38 inches), the slide began to accelerate and cracking was seen in the roadway. The slide reached its maximum inland extent in February 1980, following 7.75 inches of rain during a 10-day period. Because the Abalone Cove Landslide started along the coastline and progressed landward, it was not triggered by drag from the abutting Portuguese Bend Landslide. The major factors attributed to reactivation of the slide appear to be rainfall and rising groundwater levels (Rieter, 1984). Although no homes were destroyed as a result of this slide, the visitor's center at the landmark Wayfarers

Chapel was severely damaged and closed to the public in 1982. All but a small portion of the original structure was razed in 1995 and a new visitors center was constructed west of the slide scarp in 1999 (Daily Breeze, June 26, 1999).

A third landslide in the planning area that deserves mention is the Klondike Canyon Landslide. This landslide is located adjacent to the coastline and to the east of the much larger Portuguese Bend Landslide. Like the Portuguese Bend and the Abalone Cove Landslides, Woodring published the location of the ancient "Beach Club Landslide" in 1946. However, by that time, both Yacht Harbor Drive (in 1927) and Palos Verdes Drive South (in 1937) had been constructed across this landslide. Development of the two roadways was followed in the late 1940's by the construction of the Portuguese Bend Club and grading for the Seaview tract landward of Palos Verdes Drive South was completed in late 1956. Following record-breaking rainfall in 1977-1978, the first indications of movement of the Klondike Canyon Landslide were noted in September 1979 at the intersection of Dauntless Drive and Exultant Drive in the Seaview tract. Heavy rainfall continued during 1979-1980 and 1982-1983, accelerating land movement, which damaged local roads and eventually destroyed one home in the Seaview tract. In 1982, the Klondike Canyon Landslide Geologic Abatement District was formed and began installing dewatering wells to lower the ground water table within the slide mass. (Kerwin, Scott, "Land Stability in the Klondike Canyon," Moore and Taber professional report, no date but probably 1981 or 1982) The dewatering efforts have been successful in stabilizing the area and additional landslide abatement efforts have continued since that time, such as drainage improvements in Klondike Canyon and the installation of a private sewer system in the Portuguese Bend Beach Club.

Unlike the slower moving landslides in the Portuguese Bend area, the planning area most recently experienced two fast-moving earth failures that each caused a considerable amount of property damage. In March 1997, two office buildings located in the 900 block of Indian Peak Road in Rolling Hills Estates toppled and slid down a hillside, causing damage to another building at 655 Deep Valley Drive. In June 1999, the entire 18th fairway of the Ocean Trails Golf Course slid into the ocean, just a week prior to the course's scheduled grand opening, taking approximately 12 acres of land with it.

In its 38-year history, the City of Rancho Palos Verdes has only declared a local emergency on two occasions, both related to earth movement caused by severe weather. On March 8, 1979, the City of Rancho Palos Verdes declared a local emergency due to severe land movement resulting from heavy and unusual rains. Rancho Palos Verdes again declared a local emergency on January 17, 1995 due to severe El Nino rainstorms that caused flooding and sliding throughout the community.

Historic Southern California Landslides

1928 St. Francis Dam

Cost, $672.1 million (2000 Dollars). The dam, located in Los Angeles County, gave way on March 12, and its waters swept through the Santa Clara Valley toward the Pacific Ocean, about 54 miles away. Sixty five miles of valley was devastated, and over 500 people were killed.

1956 Portuguese Bend

Cost, $14.6 million (2000 Dollars). California Highway 14, Palos Verdes Hills. Land use on the Palos Verdes Peninsula consists mostly of single-family homes built on large lots, many of

which have panoramic ocean views. All of the houses were constructed with individual septic systems, generally consisting of septic tanks and seepage pits. Landslides have been active here for thousands of years, but recent landslide activity has been attributed in part to human activity. The Portuguese Bend Landslide began its modern movement in August 1956, when displacement was noticed at its northeast margin. Movement gradually extended down slope so that the entire eastern edge of the slide mass was moving within 6 weeks. By the summer of 1957, the entire slide mass was sliding towards the sea.

1958-1971 Pacific Palisades

Cost, $29.1 million (2000 Dollars). California Highway 1 and house damaged.

1961 Mulholland Cut

Cost, $41.5 million (2000 Dollars). On Interstate 405, 11 miles north of Santa Monica, Los Angeles County.

1963 Baldwin Hills Dam

Cost, $50 million (1963 Dollars). On December 14, the 650 foot long by 155 foot high earth fill dam gave way and sent 360 million gallons of water in a fifty foot high wall cascading onto the community below, killing five persons.

1969 Glendora

Cost, $26.9 million (2000 Dollars). Los Angeles County, 175 houses damaged, mainly by debris flows.

1969 Seventh Ave., Los Angeles County

Cost, $14.6 million (2000 Dollars). California Highway 60.

1970 Princess Park

Cost, $29.1 million (2000 Dollars). California Highway 14, ten miles north of Newhall, near Saugus, northern Los Angeles County.

1971 Upper and Lower Van Norman Dams, San Fernando

Cost, $302.4 million (2000 Dollars). Earthquake-induced landslides. Damage due to the February 9, 1971, M7.5 San Fernando, Earthquake.
The earthquake of February 9 severely damaged the Upper and Lower Van Norman Dams.

1971 Juvenile Hall, San Fernando

Cost, $266.6 million (2000 Dollars). Landslides caused by the February 9, 1971, San Fernando earthquake. In addition to damaging the San Fernando Juvenile Hall, this 1.2 km-long slide damaged trunk lines of the Southern Pacific Railroad, San Fernando Boulevard, Interstate Highway 5, the Sylmar electrical converter station, and several pipelines and canals.

1977-1980 Monterey Park, Repetto Hills, Los Angeles County

Cost, $14.6 million (2000 Dollars). 100 houses damaged in 1980 due to debris flows.

1978 Bluebird Canyon Orange County

Cost, $52.7 million (2000 Dollars). October 2, 60 houses destroyed or damaged. Unusually heavy rains in March of 1978 may have contributed to initiation of the landslide. Although the 1978 slide area was approximately 3.5 acres, it is suspected to be a portion of a larger, ancient landslide.

1979 Big Rock, California, Los Angeles County

Cost, $1.08 billion (2000 Dollars). California Highway 1 rockslide.

1980 Southern California Slides

Cost, $1.1 billion in damage (2000 Dollars). Heavy winter rainfall in 1979-90 caused damage in six Southern California counties. In 1980, the rainstorm started on February 8. A sequence of 5 days of continuous rain and 7 inches of precipitation had occurred by February 14. Slope failures were beginning to develop by February 15 and then very high-intensity rainfall occurred on February 16. As much as eight inches of rain fell in a six hour period in many locations. Records and personal observations in the field on February 16 and 17 showed that the mountains and slopes literally fell apart on those two days.

1983 San Clemente, Orange County

Cost, $65 million (2000 Dollars). California Highway 1. Litigation at that time involved approximately $43.7 million (2000 Dollars?).

1983 Big Rock Mesa

Cost, $706 million (2000 Dollars) in legal claims, condemnation of 13 houses, and 300 more threatened rockslide caused by rainfall.

1978-1980 San Diego County

Experienced major damage from storms in 1978, 1979, and 1979-80, as did neighboring areas of Los Angeles and Orange County. One hundred and twenty landslides were reported to have occurred in San Diego County during these 2 years. Rainfall for the rainy seasons of 78-79 and 79-80 was 14.82 and 15.61 inches (37.6 and 39.6 cm) respectively, compared to a 125-year average (1850-1975) of 9.71 inches (24.7 cm). Significant landslides occurred in the Friars Formation, a unit that was noted as slide-prone in the Seismic Safety Study for the City of San Diego. Of the nine landslides that caused damage in excess of $1 million, seven occurred in the Friars Formation, and two in the Santiago Formation in the northern part of San Diego County.

1994 Northridge Earthquake Landslides

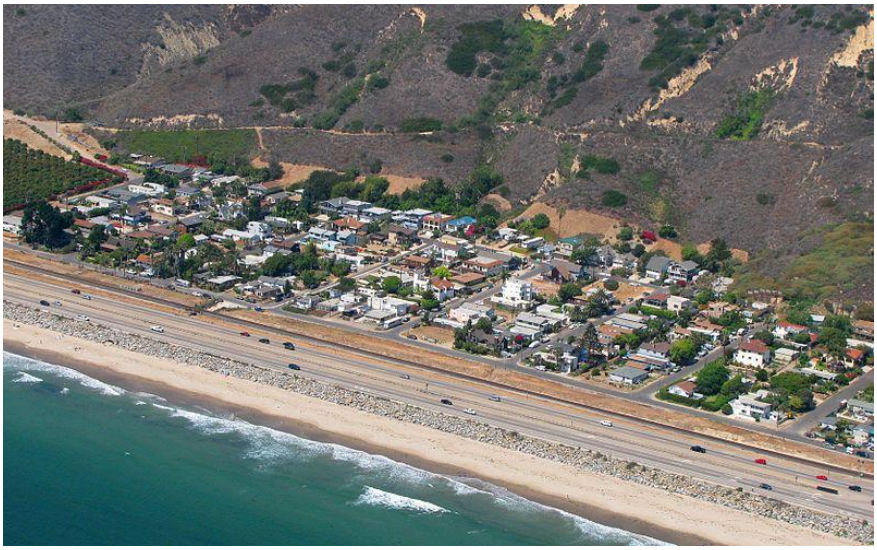
As a result of the M6.7 Northridge Earthquake, more than 11,000 landslides occurred over an area of 10,000 km^2. Most were in the Santa Susana Mountains and in mountains north of the Santa Clara River Valley. Destroyed dozens of homes, blocked roads, and damaged oil-field infrastructure. Caused deaths from Coccidioidomycosis (valley fever) the spore of which was released from the soil and blown toward the coastal populated areas. The spore was released from the soil by the landslide activity.

March 1995 Los Angeles and Ventura Counties

Above normal rainfall triggered damaging debris flows, deep-seated landslides, and flooding. Several deep-seated landslides were triggered by the storms, the most notable was the La Conchita landslide, which in combination with a local debris flow, destroyed or badly damaged 11 to 12 homes in the small town of La Conchita, about 20 km west of Ventura. There also was widespread debris-flow and flood damage to homes, commercial buildings, and roads and highways in areas along the Malibu coast that had been devastated by wildfire two years before.

January 2005 Ventura County

On January 10, 2005, a landslide once again struck the community of La Conchita, killing ten people and destroying or seriously damaging 36 houses.



Landslide Characteristics

What is a landslide?

"A landslide is defined as, the movement of a mass of rock, debris, or earth movement down a slope. Landslides are a type of "mass wasting" which denotes any down slope movement of soil and rock under the direct influence of gravity. The term "landslide" encompasses events such as rock falls, topples, slides, spreads, and flows.

Landslides are initiated by rainfall, earthquakes, volcanic activity, changes in groundwater, disturbance and change of a slope by human-caused construction activities, or any combination of these factors. Landslides also occur underwater, causing tidal waves and damage to coastal areas. These landslides are called submarine landslides."

The size of a landslide usually depends on the geology and the initial cause of the landslide. Landslides vary greatly in their volume of rock and soil, the length, width, and depth of the area affected, frequency of occurrence, and speed of movement. Some characteristics that determine the type of landslide are slope of the hillside, moisture content, and the nature of the underlying materials. Landslides are given different names, depending on the type of failure, and their composition and characteristics.

Slides move in contact with the underlying surface. These movements include rotational slides where sliding material moves along a curved surface and translational slides where movement occurs along a flat surface. These slides are generally slow moving and can be deep. Slumps are small rotational slides that are generally shallow. Slow-moving landslides occur on relatively gentle slopes and cause significant property damage, but are far less likely to result in serious injuries than rapidly moving landslides.

"Failure of a slope occurs when the force that is pulling the slope downward (gravity) exceeds the strength of the earth materials that compose the slope. They move slowly, (millimeters per

year) or move quickly and disastrously, as is the case with debris-flows. Debris-flows travels down a hillside of speeds up to 200 miles per hour (more commonly, 30 – 50 miles per hour), depending on the slope angle, water content, and type of earth and debris in the flow. These flows are initiated by heavy, usually sustained, periods of rainfall, but sometimes happen as a result of short bursts of concentrated rainfall in susceptible areas. Burned areas charred by wildfires are particularly susceptible to debris flows, given certain soil characteristics and slope conditions."

What is a Debris Flow?

A debris or mud flow is a river of rock, earth and other materials, including vegetation that is saturated with water. This high percentage of water gives the debris flow a very rapid rate of movement down a slope. Debris flows often with speeds greater than 20 mile per hour, and often move much faster. This high rate of speed makes debris flows extremely dangerous to people and property in its path.

Local Conditions

Landslides are a common hazard in California. Weathering and the decomposition of geologic materials produces conditions conducive to landslides, and human activity, further exacerbates many landslide problems.

Many landslides are difficult to mitigate, particularly in areas of large historic movement with weak underlying geologic materials. As communities continue to modify the terrain and influence natural processes, it is important to be aware of the physical properties of the underlying soils as they, along with climate, create landslide hazards. Even with proper planning, landslides continue to threaten the safety of people, property, and infrastructure, but without proper planning, landslide hazards are even more common and more destructive.

The increasing scarcity of buildable land, particularly in urban areas, increases the tendency to build on geologically marginal land. Additionally, hillside housing developments in Southern California are prized for the view lots that they provide.

Rock falls occur when blocks of material come loose on steep slopes. Weathering, erosion, or excavations, such as those along highways, cause falls where the road has been cut through bedrock. They are fast moving with the materials free falling or bouncing down the slope. In falls, material is detached from a steep slope or cliff. The volume of material involved is generally small, but large boulders or blocks of rock can cause significant damage.

Earth flows are plastic or liquid movements in which land mass (e.g. soil and rock) breaks up and flows during movement. Earthquakes often trigger flows. Debris flows normally occur when a landslide moves down slope as a semi-fluid mass scouring, or partially scouring soils from the slope along its path. Flows are, typically, rapidly moving, and tend to increase in volume as they scour out the channel. Flows often occur during heavy rainfall, can occur on gentle slopes, and move rapidly for large distances.

Landslides are often triggered by periods of heavy rainfall. Earthquakes, subterranean water flow, and excavations can also trigger landslides. Certain geologic formations are more susceptible to landslides than others. Human activities, including locating development near steep slopes, can increase susceptibility to landslide events. Landslides on steep slopes are more dangerous because movements are rapid.

Although landslides are a natural geologic process, the incidence of landslides and the impact on people are exacerbated by human activities. Grading for road construction and development increases slope steepness. Grading and construction decreases the stability of a hill slope by adding weight to the top of the slope, removing support at the base of the slope, and increasing water content. Other human activity affecting landslides include: 1) excavation, 2) drainage and groundwater alterations, and 3) changes in vegetation.

Wildland fires in hills covered with chaparral are often a precursor to debris flows in burned out canyons. The extreme heat of a wildfire creates a soil condition in which the earth becomes impervious to water by creating a waxy-like layer just below the ground surface. Since the water cannot be absorbed into the soil, it rapidly accumulates on slopes, often gathering loose particles of soil in to a sheet of mud and debris. Debris flows often originates miles away from unsuspecting persons, and approaches them at a high rate of speed with little warning.

Natural processes can cause landslides or re-activate historical landslide sites. The removal or undercutting of shoreline-supporting material along bodies of water by currents and waves produces countless small slides each year. Seismic tremors can trigger landslides on slopes historically known to have landslide movement. Earthquakes also cause additional failure (lateral spreading) that occurs on gentle slopes above steep streams and riverbanks.

Areas Particularly Susceptible to Landslides

Locations at risk from landslides or debris flows include areas with one or more of the following conditions:

- ✓ On or close to steep hills
- ✓ Steep road-cuts or excavations
- ✓ Existing landslides or places of known historic landslides (such sites often have tilted power lines, trees tilted in various directions, cracks in the ground, and irregular-surfaced ground)
- ✓ Steep areas where surface runoff is channeled, such as below culverts, V-shaped valleys, canyon bottoms, and steep stream channels
- ✓ Fan-shaped areas of sediment and boulder accumulation at the outlets of canyons
- ✓ Canyon areas below hillside and mountains that recently (within 1-6 years) were subjected to a wildland fire

Impacts of Development

Although landslides are a natural occurrence, human impact can substantially affect the potential for landslide failures in the planning area. Proper planning and geotechnical engineering will reduce the threat of safety of people, property, and infrastructure.

Excavation and Grading

Slope excavation is common in the development of home sites or roads on sloping terrain. Grading these slopes results in slopes that are steeper than the pre-existing natural slopes. Since slope steepness is a major factor in landslides, these steeper slopes are at an increased risk for landslides. The added weight of fill placed on slopes also results in an increased landslide hazard. Small landslides are fairly common along roads, in either the road cut or the road fill. Landslides occurring below new construction sites are indicators of the potential impacts stemming from excavation.

Drainage and Groundwater Alterations

Water flowing through or above ground, is often the trigger for landslides. Any activity that increases the amount of water flowing into landslide-prone slopes increases landslide hazards. Broken or leaking water or sewer lines can be especially problematic, as does water retention facilities that direct water onto slopes. However, even lawn irrigation in landslide prone locations results in damaging landslides. Ineffective storm water management and excess runoff also cause erosion, and increase the risk of landslide hazards. Drainage is affected, naturally by the geology and topography of an area. Development that results in an increase in impervious surface impairs the ability of the land to absorb water and redirects water to other areas. Channels, streams, ponding, and erosion on slopes indicate potential slope problems.

Road and driveway drains, gutters, downspouts, and other constructed drainage facilities concentrates and accelerates flow. Ground saturation and concentrated velocity flow are major causes of slope problems and triggers landslides.

Changes in Vegetation

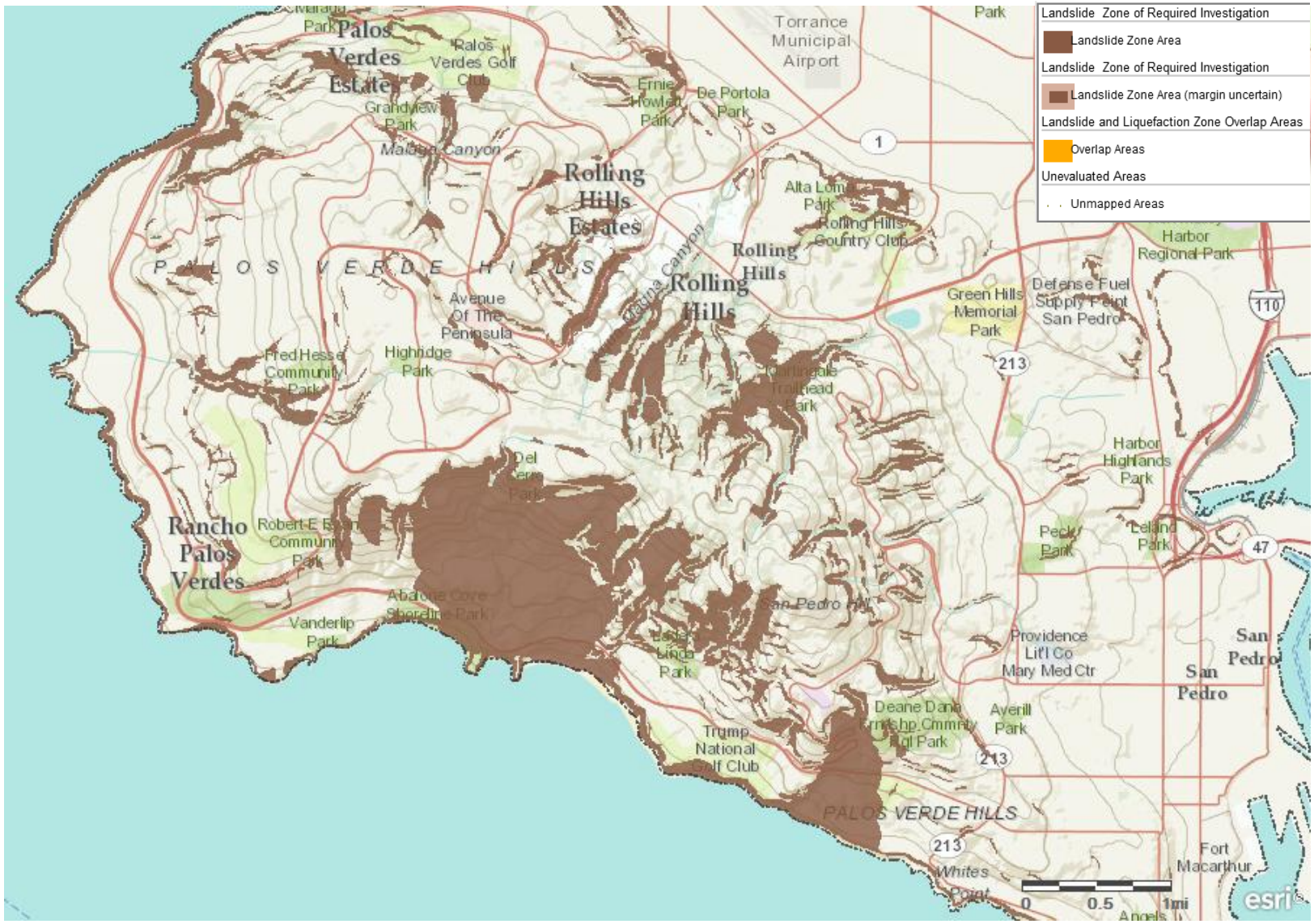
Removing vegetation from very steep slopes increases landslide hazards. Areas that experience wildfire and land clearing for development may have long periods of increased landslide hazard. Also, certain types of ground cover require constant watering to remain green. Changing away from native ground cover plants increases the risk of landslide.

Landslide Hazard Assessment

Hazard Identification

Landslide deposits include relatively shallow surficial slumps, mudflows, and debris flows, which develop within the near surface topsoils, colluviums, and weathered formational materials. Larger landslide features include deep-seated landslides within the formational sedimentary rock materials. In general, the landslides occur due to various factors including steep slope conditions, erosion, rainfall, groundwater, adverse geologic structure, and grading impacts. Large, deep-seated landslides commonly develop when weak dipping bedding planes daylight along a slope face. Faulting is also a common factor in the development of planes of weakness which contribute to landslide potential.

Map 6-1: Planning Area Landslide Hazard Map
(Source: Cal OES)



Vulnerability Assessment

Vulnerability assessment for landslides assists in predicting how different types of property and population groups are affected by a hazard. Data that includes specific landslide-prone and debris flow locations in the planning area are used to assess the population and total value of property at risk from future landslide occurrences.

Both Cities use percent of slope as a general indicator of hill slope stability. The City of Rancho Palos Verdes uses a 35% or greater threshold, and the City of Rolling Hills Estates uses a 33.3% or greater threshold to identify potentially unstable hill slopes.

While a quantitative vulnerability assessment (an assessment that describes number of lives or amount of property exposed to the hazard) has not yet been conducted for landslide events impacting the planning area, there are many qualitative factors that point to potential vulnerability. Landslides can impact major transportation arteries, blocking residents from essential services.

Past landslide events have caused major property damage or significantly impacted City residents, and continuing to map City landslide and debris flow areas will help in preventing future loss.

Risk Analysis

Factors included in assessing landslide risk include population and property distribution in the hazard area, the frequency of landslide or debris flow occurrences, slope steepness, soil characteristics, and precipitation intensity.

Attachment 6-1: Rancho Palos Verdes Public Information Handout (Source: City of Rancho Palos Verdes)

Rancho Palos Verdes, California

Palos Verdes Drive East & Palos Verdes Drive South Roadway Stabilization Project

Palos Verdes Drive East (PVDE) and Palos Verdes Drive South (PVDS), are critical transportation routes within Rancho Palos Verdes. Due to a sensitive location near unstable San Ramon Canyon, there is a strong probability of a catastrophic roadway failure with the potential to take lives, destroy homes, cut off transportation, and limit access to crucial facilities.

THE PROBLEM

The erosion of San Ramon Canyon has accelerated at an alarming rate since the 2005 storm events which resulted in a Presidential disaster declaration. Geologists and engineers conclude that the instability translates into probable roadway failure. The Canyon's streambed is now only a mere 86' from one of two hairpin turns on PVDE. Erosion of the bank will cause complete roadway failure; reconstruction will be impossible. **If PVDE is rendered useless, it cannot be reconstructed, severely altering transportation routes for emergency personnel and residents.**

For PVDS, every storm event requires emergency response to keep the road open. In a recent very dry year, emergency response was still necessary eight times to remove silt and debris. **If PVDS collapses, the debris flow will endanger approximately 250 homes and 500 senior residents located roughly 270 feet below San Ramon Canyon. Homes will be destroyed, residents will be at risk, and emergency operations will be severely compromised.**

Aerial Overview. Erosion conditions are accelerating; roadway failure is probable with reconstruction impossible.

VITAL TRANSPORTATION ROUTES and LIFE SAFETY

PVDE and PVDS are **crucial roads for emergency evacuations, emergency service providers, and access to staging areas for regional fire safety personnel**. In addition, PVDE and PVDS are essential routes to government facilities and widely used transportation networks.

Palos Verdes Drive East is one of only two access roads for a Federal Aviation Administration's communication facility; headquarters for air traffic control computer technology managing some of the most complex airspace in the country.

Palos Verdes Drive South is a vital transportation link for local residents and contributes to the overall efficient circulation for through traffic to the Coast Guard facilities at Point Vincente, the Ports of Los Angeles and Long Beach, and Interstate 110.

The 43,000 residents of Rancho Palos Verdes and the entire population of the Palos Verdes Peninsula depend on PVDE and PVDS for essential transportation and safety needs. Roadway failures would compromise immediate access for fire, police and emergency personnel, greatly increase commute times, destroy two vital transportation links to government facilities, and significantly decrease economic revenue by limiting access to businesses, local attractions and amenities, including world-class resorts.

THE SOLUTION

The Palos Verdes Drives East and Palos Verdes Drive South Roadway Stabilization Project involves planning, engineering, environmental clearance and mitigation, right-of-way acquisition, and construction of significant drainage restoration work to stabilize Palos Verdes Drive East and Palos Verdes Drive South. Total estimated cost of the project is $19.5 million.

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Rancho Palos Verdes, California

Palos Verdes Drive East & Palos Verdes Drive South Roadway Stabilization Project

Key Site Features

San Ramon Canyon. Instability of Canyon is acceleration at alarming rate. Failure will severely impact local circulation, economy, and emergency response.

Stabilization Sites. Stabilize approximately one mile of PVDE. PVDE cannot be reconstructed if Canyon fails. Stabilize approximately 300 feet on PVDS. The two hairpin turns on PVDE are less than 100 feet from the Canyon edge. Actual construction work will occur in San Ramon Canyon

Approximately 250 homes and 500 senior residents are located roughly 270 feet below feet below San Ramon Canyon

Open space subject to wildfire hazard. PVDE provides access to critical staging areas for emergency personnel.

Federal Aviation Administration communications center located approximately 2.8 miles north of project site. PVDE is only one of two access points to facility that controls all Southern California airspace.

U.S. Coast Guard Facility located approximately 4.5 miles west of project site.

Ports of Los Angeles and Long Beach located approximately 3.5 and 8.4 miles east of the project site, respectively.

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Community Landslide Issues

What is Susceptible to Landslides?

Landslides affect utility services, transportation systems, and critical lifelines. The planning area may suffer immediate damages and loss of service. Disruption of infrastructure, roads, and critical facilities also have a long-term effect on the economy. Utilities, including potable water, wastewater, telecommunications, natural gas, and electric power are all essential to service community needs. Loss of electricity has the most widespread impact on other utilities and on the whole community. Natural gas pipes are also at risk of breakage from landslide movements as small as an inch or two.

Another potential impact affecting the planning area is an earth movement that creeps or slides into a structure or vital open area.

If a structure is identified to be in a landslide area, it does not necessarily mean that the structure will be impacted by a landslide. It means that the structure is considered to be at risk to landslide and depending on other factors may or may not be impacted.

Impact of Landslides in the Planning Area*

Landslides and their impacts will vary by location and severity of any given Landslide event and will likely only affect certain areas of the county during specific times. Based on the risk assessment, it is evident that landslides will continue to have potentially devastating economic impacts to certain areas of the planning area. Impacts that are not quantified, but can be anticipated in future events, include:

- ✓ Injury and loss of life
- ✓ Commercial and residential structural damage
- ✓ Disruption of and damage to public infrastructure
- ✓ Secondary health hazards e.g. mold and mildew
- ✓ Damage to roads/bridges resulting in loss of mobility
- ✓ Significant economic impact (jobs, sales, tax revenue) upon the community
- ✓ Negative impact on commercial and residential property values
- ✓ Significant disruption to students and teachers as temporary facilities and relocations would likely be needed

Severity

Historically, landslides triggered by earthquakes are a major cause of earthquake damage. Landslides tied to the 1971 San Fernando, 1989 Loma Prieta, and 1994 Northridge Earthquakes destroyed or damaged numerous homes/structures, blocking major transportation corridors, and damaging life-line infrastructure.

*** ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3**

B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))

Roads and Bridges

Losses incurred from landslide hazards in the planning area are often associated with roads. RPV uses a private contractor and RHE uses the Los Angeles County Public Works Department for responding to slides that inhibit the flow of traffic or are damaging a road. They are tasked with responding to slides that inhibit the flow of traffic or are damaging a road or a bridge. The road departments do their best to communicate with residents and businesses impacted by landslides.

It is not cost-effective to mitigate all slides because of limited funds, and because some historical slides are likely to become active again even with mitigation measures. The Cities and County alleviate problem areas by grading slides, and by installing new drainage systems on the slopes to divert water from the landslides. This type of response activity is often the most cost-effective in the short-term, but is only temporary. Unfortunately, many property owners are unaware of slides and the dangers associated with them.

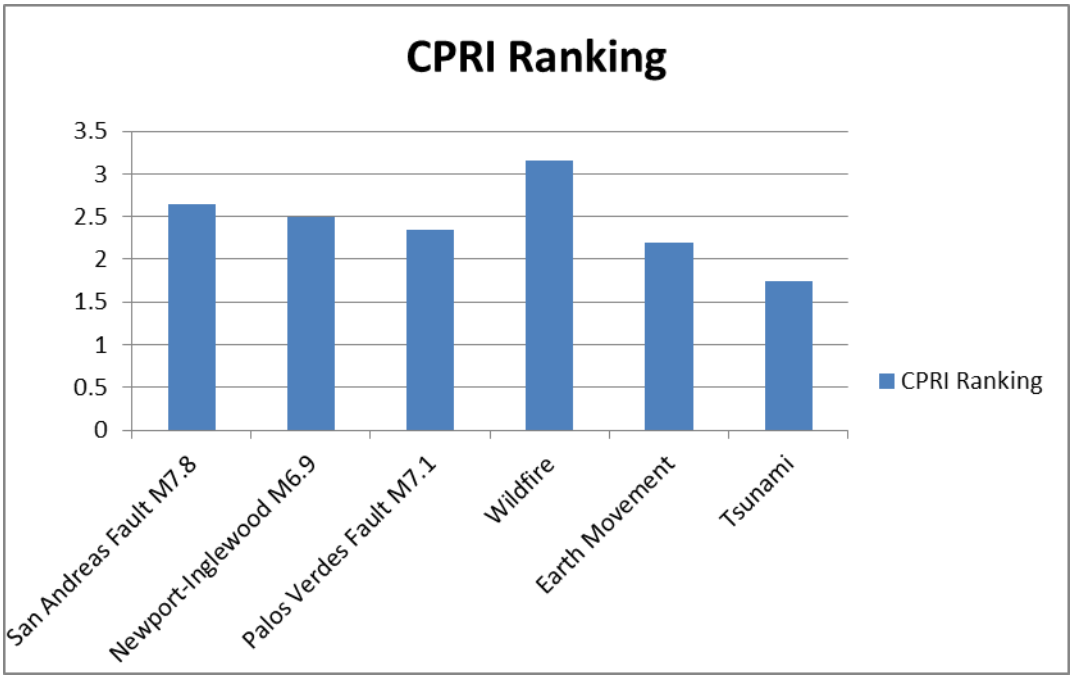
Lifelines and Critical Facilities

Lifelines and critical facilities should remain accessible, if possible, during a natural hazard event. The impact of closed transportation arteries are increased if the closed road or bridge is critical for hospitals and other emergency facilities. Losses of power and phone service are also potential consequences of landslide events. Due to heavy rains, soil erosion in hillside areas can be accelerated, resulting in loss of soil support beneath high voltage transmission towers in hillsides and remote areas. Flood events can also cause landslides, which have serious impact on gas lines that are located in vulnerable soils.

Landslide Mitigation Activities

Landslide mitigation activities include current mitigation programs and activities that are implemented by local or City organizations. (See Mitigation Actions Matrix)

Section 7: Tsunami Hazards



Calculated Priority Risk Index (CPRI)	
Probability:	Unlikely
Magnitude/Severity:	Limited
Warning Time:	Less than 6 hours
Duration:	Less than 6 hours

Why are Tsunamis a Threat to the Planning Area?*

"Since 1812, the California coast has had 14 tsunamis with wave heights higher than three feet; six of these were destructive. The Channel Islands were hit by a big tsunami in the early 1800s. The worst tsunami resulted from the 1964 Alaskan earthquake and caused 12 deaths and at least $17 million in damages in northern California."

History has shown that the probability of a tsunami in the planning area is a relatively low threat and there is not considered to be any threat to the City of RHE given that the City has no coastline.

However, the planning area has 7 ½ miles of coastline in the City of Rancho Palos Verdes. If a

* ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B2
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))

tsunami should occur, the consequences would be great. The impact could cause loss of life, destroy many high priced homes along the bluffs and greatly affect City's many coastal public parks and commercial businesses, such as the Trump National Golf Club and the Terranea Resort. Even if all residents and visitors were safely evacuated, the damage to property would still be tremendous. Fortunately, the planning area has yet to be significantly impacted by a Tsunami event.

*Impact of Tsunamis in the Planning Area**

Based on the risk assessment, it is evident that tsunamis will continue to have potentially devastating economic impacts to certain areas of the planning area. Impacts that are not quantified, but can be anticipated in future events, include:

- ✓ Injury and loss of life
- ✓ Disruption of and damage to district infrastructure
- ✓ Secondary health hazards e.g. mold and mildew
- ✓ Significant economic impact (jobs, sales, tax revenue) upon the staff and students
- ✓ Significant disruption to students and teachers as temporary facilities and relocations would likely be needed

What are Tsunamis?

The phenomenon we call "tsunami" (soo-NAH-mee) is a series of traveling ocean waves of extremely long length generated primarily by earthquakes occurring below or near the ocean floor. Underwater volcanic eruptions and landslides can also generate tsunamis. In the deep ocean, the tsunami waves move across the deep ocean with a speed exceeding 500 miles per hour, and a wave height of only a few inches. Tsunami waves are distinguished from ordinary ocean waves by their great length between wave crests, often exceeding 60 miles in length or more, and time between these crests, ranging from 10 minutes to an hour.

As they reach the shallow waters of the coast, the waves slow down and the water can pile up into a wall of destruction up to 30 feet or more in height. The effect can be amplified where a bay, harbor or lagoon funnels the wave as it moves inland. Large tsunamis have been known to rise over 100 feet. Even a tsunami 1-3 feet high can be very destructive and cause many deaths and injuries.

Tsunamis typically are classified as either local or distant. Tsunamis from local sources usually result from earthquakes occurring off nearby coasts. Tsunamis from distant sources are the most common type observed along the California Coast. Tsunamis generated by earthquakes in South America and the Aleutian-Alaskan region have posed a greater hazard to the West Coast of the United States than locally generated tsunamis. There is a history of Pacific-wide tsunamis occurring every 10 to 20 years. (Source: TyCom EIR, 9/2001)

*** ELEMENT B: HAZARD IDENTIFICATION AND RISK ASSESSMENT | B3**

B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))

What causes Tsunami?

There are many causes of tsunamis but the most prevalent is earthquakes. In addition, landslides, volcanic eruptions, explosions, and even the impact of cosmic bodies, such as meteorites, can generate tsunamis.

Plate Tectonics

Plate Tectonic Theory is based on an earth model characterized by a small number of lithospheric plates, 40 to 150 miles thick that float on a viscous under-layer called the asthenosphere. These plates, which cover the entire surface of the earth and contain both the continents and sea floor, move relative to each other at rates of up to several inches per year. The region where two plates come in contact is called a plate boundary, and the way in which one plate moves relative to another determines the type of boundary. The types of movement that creates a boundary is: 1) spreading, where the two plates move away from each other; 2) subduction, where the two plates move toward each other and one slides beneath the other; and 3) transform, where the two plates slide horizontally past each other. Subduction zones are characterized by deep ocean trenches, and the volcanic islands or volcanic mountain chains associated with the many subduction zones around the Pacific Rim are sometimes called the Ring of Fire.(Source: http://www.prh.noaa.gov/itic/library/about_tsu/faqs.html - 1)

Earthquakes and Tsunamis

An earthquake can be caused by volcanic activity, but most are generated by movements along fault zones associated with the plate boundaries. Most strong earthquakes, representing 80% of the total energy released worldwide by earthquakes, occur in subduction zones where an oceanic plate slides under a continental plate or another younger oceanic plate.

Not all earthquakes generate tsunamis. To generate a tsunami, the fault where the earthquake occurs must be underneath or near the ocean, and cause vertical movement of the sea floor over a large area, hundreds or thousands of square miles. “By far, the most destructive tsunamis are generated from large, shallow earthquakes with an epicenter or fault line near or on the ocean floor.” (Source: http://www.prh.noaa.gov/itic/library/about_tsu/faqs.html#1) The amount of vertical and horizontal motion of the sea floor, the area over which it occurs, the simultaneous occurrence of slumping of underwater sediments due to the shaking, and the efficiency with which energy is transferred from the earth’s crust to the ocean water are all part of the tsunami generation mechanism. The sudden vertical displacements over such large areas, disturb the ocean's surface, displace water, and generate destructive tsunami waves. (Source: http://www.prh.noaa.gov/itic/library/about_tsu/faqs.html#1)

Although all oceanic regions of the world can experience tsunamis, the most destructive and repeated occurrences of tsunamis are in the Pacific Rim region.

Tsunami Earthquakes

In 1960, a large tsunami caused widespread death and destruction throughout the Pacific was generated by an earthquake located off the coast of Chile. It caused loss of life and property damage not only along the Chile coast but also in Hawaii and as far away as Japan. The Great Alaskan Earthquake of 1964 killed 106 people and produced deadly tsunami waves in Alaska, Oregon and California.

The September 2, 1992 Masachapa Nicaragua Earthquake (M7.2) was barely felt by residents along the coast of Nicaragua. Located well off-shore, the severity of shaking on a scale of I to XII, was mostly II along the coast, and reached III at only a few places. Twenty to 70 minutes after the earthquake occurred, a tsunami struck the coast of Nicaragua with wave amplitudes up to 13 feet above normal sea level in most places and a maximum run-up height of 35 ft. The waves caught coastal residents by complete surprise and caused many casualties and considerable property damage.

This tsunami was caused by a tsunami earthquake, an earthquake that produces an unusually large tsunami relative to the earthquake magnitude. Tsunami earthquakes are characterized by a very shallow focus, fault dislocations greater than several meters, and fault surfaces that are smaller than for a normal earthquake.

Tsunami earthquakes are also slow earthquakes, with slippage along the fault beneath the sea floor occurring more slowly than it would in a normal earthquake. The only known method to quickly recognize a tsunami earthquake is to estimate a parameter called the seismic moment using very long period seismic waves (more than 50 seconds/cycle). Two other destructive and deadly tsunamis from tsunami earthquakes have occurred in recent years in Java, Indonesia (June 2, 1994) and Peru (February 21, 1996).

> "Less frequently, tsunami waves can be generated from displacements of water resulting from rock falls, icefalls and sudden submarine landslides or slumps. Such events may be caused impulsively from the instability and sudden failure of submarine slopes, which are sometimes triggered by the ground motions of a strong earthquake. For example in the 1980's, earth moving and construction work of an airport runway along the coast of Southern France, triggered an underwater landslide, which generated destructive tsunami waves in the harbor of Thebes." (Source: http://www.prh.noaa.gov/itic/library/about_tsu/faqs.html#1)

In July 1993, a tsunami generated in the Sea of Japan killed over 120 people in Japan. Damage also occurred in Korea and Russia but spared other countries since the tsunami wave energy was confined within the Sea of Japan. The 1993 Japan Sea tsunami is known as a "regional event" since its impact was confined to a relatively small area. For people living along the northwestern coast of Japan, the tsunami waves followed the earthquake within a few minutes.

During the 1990's, destructive regional tsunamis also occurred in Nicaragua, Indonesia, the Philippines, Papua New Guinea, and Peru, killing thousands of people. Others caused property damage in Chile and Mexico. Some damage also occurred in the far field in the Marquesas Islands (French Polynesia) from the July 30, 1995, Chilean and February 21, 1996, Peruvian tsunamis.

On December 26, 2004 the second biggest earthquake in recorded history occurred off the coast of Indonesia. The Magnitude 9.3 earthquake unleashed a devastating tsunami that travelled thousands of kilometers across the Indian Ocean, taking the lives of nearly 230,000 people in countries as far apart as Indonesia, the Maldives, Sri Lanka and Somalia.

The 2011 earthquake off the Pacific coast of Tōhoku, also known as the 2011 Tōhoku Earthquake, the Great East Japan Earthquake, (Japanese: "Eastern Japan Great Earthquake Disaster") was a M9.0 (Mw) undersea megathrust earthquake off the coast of Japan that

occurred at 14:46 JST (05:46 UTC) on Friday, March 11, 2011, with the epicenter approximately 70 kilometers (43 mi) east of the Oshika Peninsula of Tōhoku and the hypocenter at an underwater depth of approximately 32 km (20 mi). It was the most powerful known earthquake to have hit Japan, and one of the five most powerful earthquakes in the world overall since modern record-keeping began in 1900. It was so powerful the island of Honshu was moved 8 feet eastward. The earthquake triggered extremely destructive tsunami waves of up to 40.5 meters (133 ft) in Miyako, Iwate, and Tōhoku. In some cases traveling up to 10 km (6 mi) inland. In addition to loss of life and destruction of infrastructure, the tsunami caused a number of nuclear accidents, primarily the ongoing level 7 meltdowns at three reactors in the Fukushima I Nuclear Power Plant complex, and the associated evacuation zones affecting hundreds of thousands of residents.

The Japanese National Police Agency has confirmed 15,719 deaths, 5,718 injured, and 4,616 people missing across eighteen prefectures, as well as over 125,000 buildings damaged or destroyed.

Tsunami Characteristics

How Fast?

Unnoticed tsunami waves can travel at the speed of a commercial jet plane, over 500 miles per hour. They can move from one side of the Pacific Ocean to the other in less than a day. This great speed makes it important to be aware of the tsunami as soon as it is generated.

Scientists can predict when a tsunami will arrive at various places by knowing the source characteristics of the earthquake that generated the tsunami and the characteristics of the sea floor along the paths to those places. Tsunamis travel much slower in more shallow coastal waters where their wave heights begin to increase dramatically.

How Big?

Offshore and coastal features can determine the size and impact of tsunami waves. Reefs, bays, entrances to rivers, undersea features, and the slope of the beach all help to modify the tsunami as it attacks the coastline. When the tsunami reaches the coast and moves inland, the water level can rise many feet. In extreme cases, water level has risen to more than 50 feet for tsunamis of distant origin and over 100 feet for tsunami waves generated near the earthquake's epicenter. The first wave may not be the largest in the series of waves. One coastal community may see no damaging wave activity while in another nearby community destructive waves can be large and violent. The flooding can extend inland by 1,000 feet or more, covering large expanses of land with water and debris.

How Frequent?

Since scientists cannot predict when earthquakes will occur, they cannot determine exactly when a tsunami will be generated. However, by looking at past historical tsunamis and run-up maps, scientists know where tsunamis are most likely to be generated. Past tsunami height measurements are useful in predicting future tsunami impact and flooding limits at specific coastal locations and communities.

Severity

A major tsunami occurring near the planning area could cause deaths and injuries, extensive property damage, fires, hazardous material spills, and other dangers for properties within a mile of the coastline.

The time of day and season of the year would have a profound impact on the number of dead and injured and the amount of property damage to the region as a whole. Support of damage control and disaster relief could be required from other local governments and private organizations, as well as the state and federal governments.

Types of Tsunamis

Pacific-Wide and Regional Tsunamis

Tsunamis can be categorized as “local” and “Pacific-Wide.” Typically, a Pacific-Wide tsunami is generated by major vertical ocean bottom movement in offshore deep trenches. A “local” tsunami can be a component of the Pacific-Wide tsunami in the area of the earthquake or a wave that is confined to the area of generation within a bay or harbor and caused by movement of the bay itself or landslides.

In less than a day, tsunamis can travel from one side of the Pacific to the other. However, people living near areas where large earthquakes occur may find that the tsunami waves will reach their shores within minutes of the earthquake. For these reasons, the tsunami threat to many areas such as Alaska, the Philippines, Japan and the United States West Coast can be immediate (for tsunamis from nearby earthquakes which take only a few minutes to reach coastal areas) or less urgent (for tsunamis from distant earthquakes which take from three to 22 hours to reach coastal areas).

History of Regional Tsunamis

Local

A local tsunami may be the most serious threat as it strikes suddenly, sometimes before the earthquake shaking stops. Alaska has had six serious local tsunamis in the last 80 years and Japan has had many more.

Local History of Tsunamis

Tsunamis have been reported since ancient times. They have been documented extensively in California since 1806. Although the majority of tsunamis have occurred in Northern California, Southern California has been impacted as well. In the 1930’s, four tsunamis struck the Los Angeles County, Orange County, and San Diego County coastal areas. In Orange County the

tsunami wave reached heights of 20 feet or more above sea level. In 1964, following the Alaska Earthquake (Magnitude 8.2), tidal surges of approximately 4 feet to 5 feet hit the Huntington Harbor area causing moderate damage.

Table 7-1: Tsunami Events in California 1930-2012
(Source: Worldwide Tsunami Database, www.ngdc.noaa.gov)

Date	Location	Maximum Run-up*(meters)	Earthquake Magnitude
08/31/1930	Redondo Beach	6.10	5.2
08/31/1930	Santa Monica	6.10	5.2
08/31/1930	Venice	6.10	5.2
03/11/1933	La Jolla	0.10	6.3
03/11/1933	Long Beach	0.10	6.3
08/21/1934	Newport Beach	12.00	Unknown
02/09/1941	San Diego	Unknown	6.6
10/18/1989	Monterey	0.40	7.1
10/18/1989	Moss Landing	1.00	7.1
10/18/1989	Santa Cruz	0.10	7.1
04/25/1992	Arena Cove	0.10	7.1
04/25/1992	Monterey	0.10	7.1
09/01/1994	Crescent City	0.14	7.1
11/04/2000	Point Arguello	5.00	Unknown
6/15/2005	N. California	0.10	7.2

* Maximum Run-up (meters) -The maximum water height above sea level. The Run-up is the height the tsunami reached above a reference level such as mean sea level. It is not always clear which reference level was used.

Tsunami Hazard Assessment

Hazard Identification

The tsunami threat to the planning area is considered low. Although the risk is considered low, the impacts could be high.

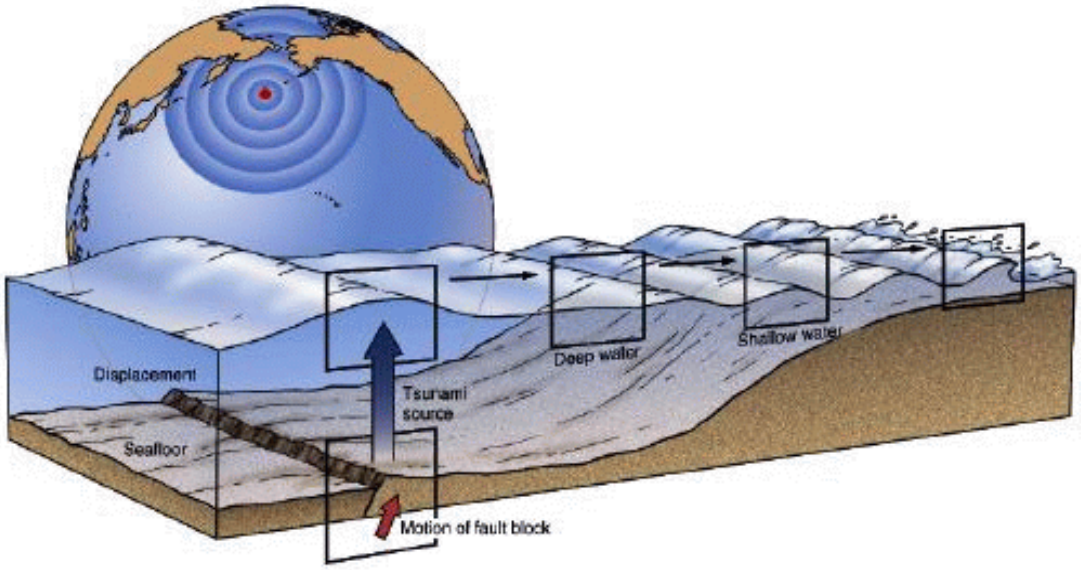
Damage Factors of Tsunamis

Tsunamis cause damage in three ways: 1) inundation, 2) wave impact on structures, and 3) erosion.

> "Strong, tsunami-induced currents lead to the erosion of foundations and the collapse of bridges and sea walls. Flotation and drag forces move houses and overturn railroad cars. Considerable damage is caused by the resultant floating debris, including boats and cars that become dangerous projectiles that may crash into buildings, break power lines, and may start fires. Fires from damaged ships in ports or from ruptured coastal oil storage tanks and refinery facilities can

cause damage greater than that inflicted directly by the tsunami. Of increasing concern is the potential effect of tsunami draw down, when receding waters uncover cooling water intakes of nuclear power plants." (Source: http://www.prh.noaa.gov/itic/library/about_tsu/faqs.html#1)

Figure 7-1: Tsunami Formation



Tsunamis are due to large off-shore earthquakes and ocean landslides. Dangerous tsunamis would most likely originate in the Aleutian and Chilean offshore submarine trenches. The planning area's vulnerable properties have a west-southwest facing orientation that may be vulnerable to tsunamis or tidal surges from the south and from the west.

Landslides

Although less common worldwide, tsunami waves can be generated from the displacement of water resulting from rock falls, icefall, and sudden submarine landslides. These types of events may be caused spontaneously from the instability and sudden failure of submarine slopes. The ground motions of a strong earthquake can also sometimes trigger them. In the 1980's, earth moving and construction work of an airport runway along the coast of Southern France, triggered an underwater landslide, which generated destructive tsunami waves in the harbor of Thebes, Egypt.

According to the Rancho Palos Verdes General Plan, the Palos Verdes Peninsula was uplifted above sea level by movement on two sub-parallel bounding faults, the Palos Verdes Fault on the northeast and the San Pedro Fault offshore on the southwest. Similar geologic phenomenon created the Channel Islands that lie offshore from the Peninsula. Submarine topographic mapping of the San Pedro Channel and Redondo Beach Trench have revealed that, similar to the marine terraces that form the Peninsula, there are a series of steep slopes between the Peninsula coastline and Catalina Island. Similar to the ancient landslides that have been documented on the Peninsula, some of these slopes show evidence of failure. Therefore, it is conceivable that a local tsunami could be generated by an underwater landslide or avalanche.

Tsunami Watches and Warnings

Warning System

The tsunami warning system in the United States is a function of the National Oceanic and Atmospheric Administration's (NOAA) National Weather Service. Development of the tsunami warning system was impelled by the disastrous waves generated in the 1964 Alaska Tsunami, which surprised Hawaii and the U.S. West Coast, taking a heavy toll in life and property.

The disastrous 1964 tsunami resulted in the development of a regional warning system in Alaska. The Alaska Tsunami Warning Center (ATWC) is in Palmer, Alaska. This facility is the nerve center for an elaborate telemetry network of remote seismic stations in Alaska, Washington, California, Colorado, and other locations. Tidal data is also telemetered directly to the ATWC from eight Alaskan locations. Tidal data from Canada, Washington, Oregon, and California are available via telephone, teletype, and computer readout.

Notification

The National Warning System (NAWAS) is an integral part of the Alaska Tsunami Warning Center. Reports of major earthquakes occurring anywhere in the Pacific Basin that may generate seismic sea waves are transmitted to the Honolulu Observatory for evaluation. An Alaska Tsunami Warning Center is also in place for public notification of earthquakes in the Pacific Basin near Alaska, Canada, and Northern California. The Observatory Staff determines action to be taken and relays warnings over the NAWAS circuits to inform and warn West Coast states. The State NAWAS circuit is used to relay the information to the Orange County Operational Area warning center which will in turn relay the information to local warning points in coastal areas. The same information is also transmitted to local jurisdictions over appropriate radio systems, teletype, and telephone circuits to ensure maximum dissemination.

Los Angeles County will use the Emergency Alert System (EAS) to warn the public of an anticipated tsunami.

A Tsunami Watch Bulletin is issued if an earthquake has occurred in the Pacific Basin and could cause a tsunami. A Tsunami Warning Bulletin is issued when an earthquake has occurred and a tsunami is spreading across the Pacific Ocean. When a threat no longer exists, a Cancellation Bulletin is issued.

Vulnerability and Risk

With an analysis of tsunami events depicted in the "Local History" section, it can be deduced that a tsunami would significantly impact life, property, infrastructure and transportation.

Community Tsunami Issues

What is Susceptible to Tsunami?

As shown on Maps 7-1 through 7-3 the greatest vulnerability to tsunamis are properties located near the coastline of Rancho Palos Verdes.

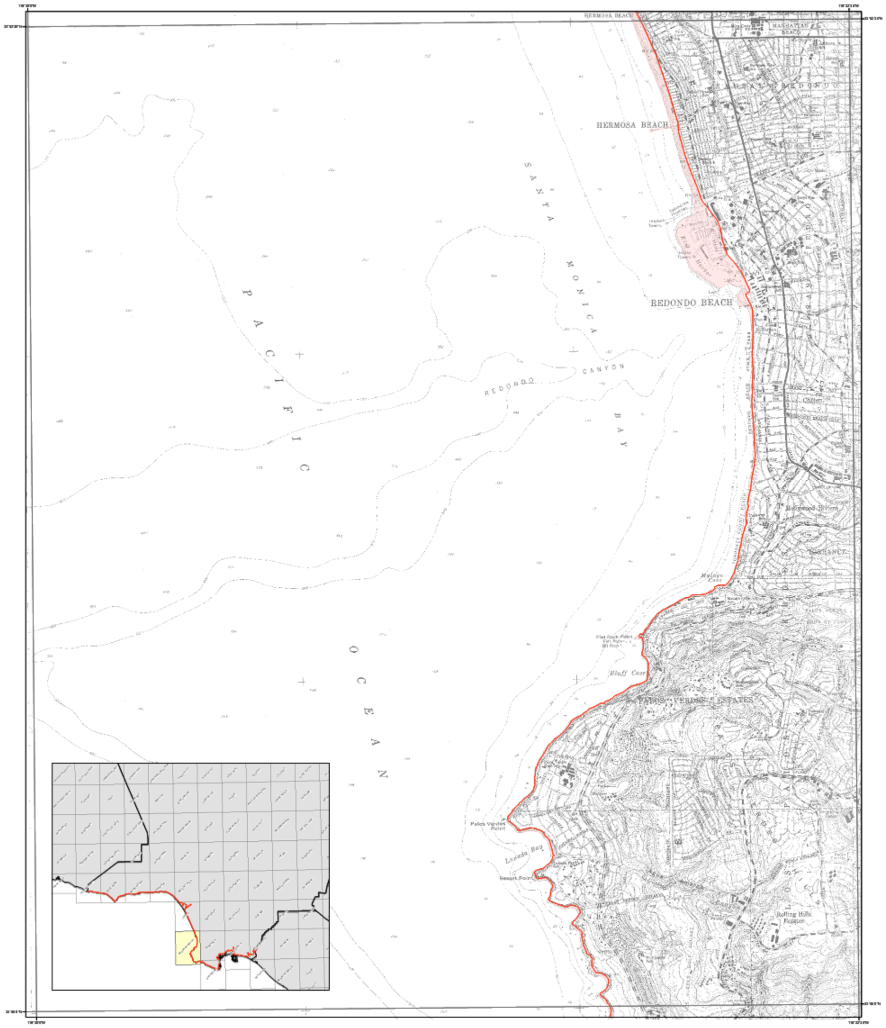
Tsunami "maximum run-up" projections were modeled by the University of Southern California and distributed by the California Office of Emergency Services for the purposes of identifying tsunami hazards. The tsunami model was the result of a combination of inundation modeling and onsite surveys and shows maximum projected inundation levels from tsunamis along the entire coast of Los Angeles County. The maximum run-up for the maps below is approximately 42 feet. This means that based on the scenario tsunami, the displaced water level would be approximately 42 feet above the normal tide for that day and time.

Map 7-1: Tsunami Inundation Map – Redondo Beach Quadrangle
(Source: State of California Department of Conservation)

California Emergency Management Agency
California Geological Survey
University of Southern California

Tsunami Inundation Map for Emergency Planning
Redondo Beach Quadrangle

State of California
County of Los Angeles



METHOD OF PREPARATION

Initial tsunami modeling was performed by the University of Southern California (USC) Tsunami Research Center funded through the California Emergency Management Agency (CalEMA) by the National Tsunami Hazard Mitigation Program. The tsunami modeling process utilized the MOST (Method of Splitting Tsunamis) computational program (Version 0), which allows for wave evolution over a variable bathymetry and topography used for the inundation mapping (Titov and Gonzalez, 1997; Titov and Synolakis, 1998).

The bathymetric/topographic data that were used in the tsunami models consist of a series of nested grids. Near-shore grids with a 3 arc-second (75- to 90-meters) resolution or higher, were adjusted to "Mean High Water" sea-level conditions, representing a conservative sea level for the intended use of the tsunami modeling and mapping.

A suite of tsunami source events was selected for modeling, representing realistic local and distant earthquakes and hypothetical extreme undersea, near-shore landslides (Table 1). Local tsunami sources that were considered include offshore reverse-thrust faults, restraining bends on strike-slip fault zones and large submarine landslides capable of significant seafloor displacement and tsunami generation. Distant tsunami sources that were considered include great subduction zone events that are known to have occurred historically (1960 Chile and 1964 Alaska earthquakes) and others which can occur around the Pacific Ocean "Ring of Fire."

In order to enhance the result from the 75- to 90-meter inundation grid data, a method was developed utilizing higher-resolution digital topographic data (3- to 10-meters resolution) that better defines the location of the maximum inundation line (U.S. Geological Survey, 1993; Intermap, 2003; NOAA, 2004). The location of the enhanced inundation line was determined by using digital imagery and terrain data on a GIS platform with consideration given to historic inundation information (Lander, et al., 1993). This information was verified, where possible, by field work coordinated with local county personnel.

The accuracy of the inundation line shown on these maps is subject to limitations in the accuracy and completeness of available terrain and tsunami source information, and the current understanding of tsunami generation and propagation phenomena as expressed in the models. Thus, although an attempt has been made to identify a credible upper bound to inundation at any location along the coastline, it remains possible that actual inundation could be greater in a major tsunami event.

This map does not represent inundation from a single scenario event. It was created by combining inundation results for an ensemble of source events affecting a given region (Table 1). For this reason, all of the inundation region in a particular area will not likely be inundated during a single tsunami event.

References:

Intermap Technologies, Inc., 2003, Intermap product handbook and quick start guide: Intermap NEXTmap document on 5-meter resolution data, 112 p.

Lander, J.F., Lockridge, P.A., and Kozuch, M.J., 1993, Tsunamis Affecting the West Coast of the United States 1806-1992: National Geophysical Data Center Key to Geophysical Record Documentation No. 29, NOAA, NESDIS, NGDC, 242 p.

National Atmospheric and Oceanic Administration (NOAA), 2004, Interferometric Synthetic Aperture Radar (IfSAR) Digital Elevation Models from GeoSAR platform (EarthData): 3-meter resolution data.

Titov, V.V., and Gonzalez, F.I., 1997, Implementation and Testing of the Method of Tsunami Splitting (MOST): NOAA Technical Memorandum ERL PMEL – 112, 11 p.

Titov, V.V., and Synolakis, C.E., 1998, Numerical modeling of tidal wave runup: Journal of Waterways, Port, Coastal and Ocean Engineering, ASCE, 124 (4), pp 157-171.

U.S. Geological Survey, 1993, Digital Elevation Models: National Mapping Program, Technical Instructions, Data Users Guide 5, 48 p.

TSUNAMI INUNDATION MAP FOR EMERGENCY PLANNING

State of California ~ County of Los Angeles

REDONDO BEACH QUADRANGLE

March 1, 2009

SCALE 1:24,000

Table 1: Tsunami sources modeled for the Los Angeles County coastline.

Sources (M = moment magnitude used in modeled event)		Areas of Inundation Map Coverage and Sources Used		
		Malibu	Santa Monica	Los Angeles Harbor
Local Sources	Anacapa-Dume Fault	X	X	
	Catalina Fault	X	X	X
	Channel Island Thrust Fault		X	
	Newport-Inglewood Fault			X
	Santa Monica Fault	X	X	
	Palos Verdes Landslide #1		X	X
	Palos Verdes Landslide #2			X
Distant Sources	Cascadia Subduction Zone #2 (M9.2)		X	X
	Central Aleutians Subduction Zone#1 (M8.9)		X	X
	Central Aleutians Subduction Zone#2 (M8.9)		X	X
	Central Aleutians Subduction Zone#3 (M9.2)	X	X	X
	Chile North Subduction Zone (M9.4)	X	X	X
	1960 Chile Earthquake (M9.3)		X	X
	1964 Alaska Earthquake (M9.2)	X	X	X
	Japan Subduction Zone #2 (M8.8)		X	X
	Kuril Islands Subduction Zone #2 (M8.8)		X	X
	Kuril Islands Subduction Zone #3 (M8.8)		X	X
	Kuril Islands Subduction Zone #4 (M8.8)		X	X

Cal EMA | CGS California Geological Survey | USC University of Southern California

MAP EXPLANATION

Tsunami Inundation Line

Tsunami Inundation Area

PURPOSE OF THIS MAP

This tsunami inundation map was prepared to assist cities and counties in identifying their tsunami hazard. It is intended for local jurisdictional, coastal evacuation planning uses only. This map, and the information presented herein, is not a legal document and does not meet disclosure requirements for real estate transactions nor for any other regulatory purpose.

The inundation map has been compiled with best currently available scientific information. The inundation line represents the maximum considered tsunami runup from a number of extreme, yet realistic, tsunami sources. Tsunamis are rare events; due to a lack of known occurrences in the historical record, this map includes no information about the probability of any tsunami affecting any area within a specific period of time.

Please refer to the following websites for additional information on the construction and/or intended use of the tsunami inundation map:

State of California Emergency Management Agency, Earthquake and Tsunami Program: http://www.oes.ca.gov/WebPage/oeswebsite.nsf/Content/B1EC 51BA215931768825741F005E8D80?OpenDocument

University of Southern California – Tsunami Research Center: http://www.usc.edu/dept/tsunamis/2005/index.php

State of California Geological Survey Tsunami Information: http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/index.htm

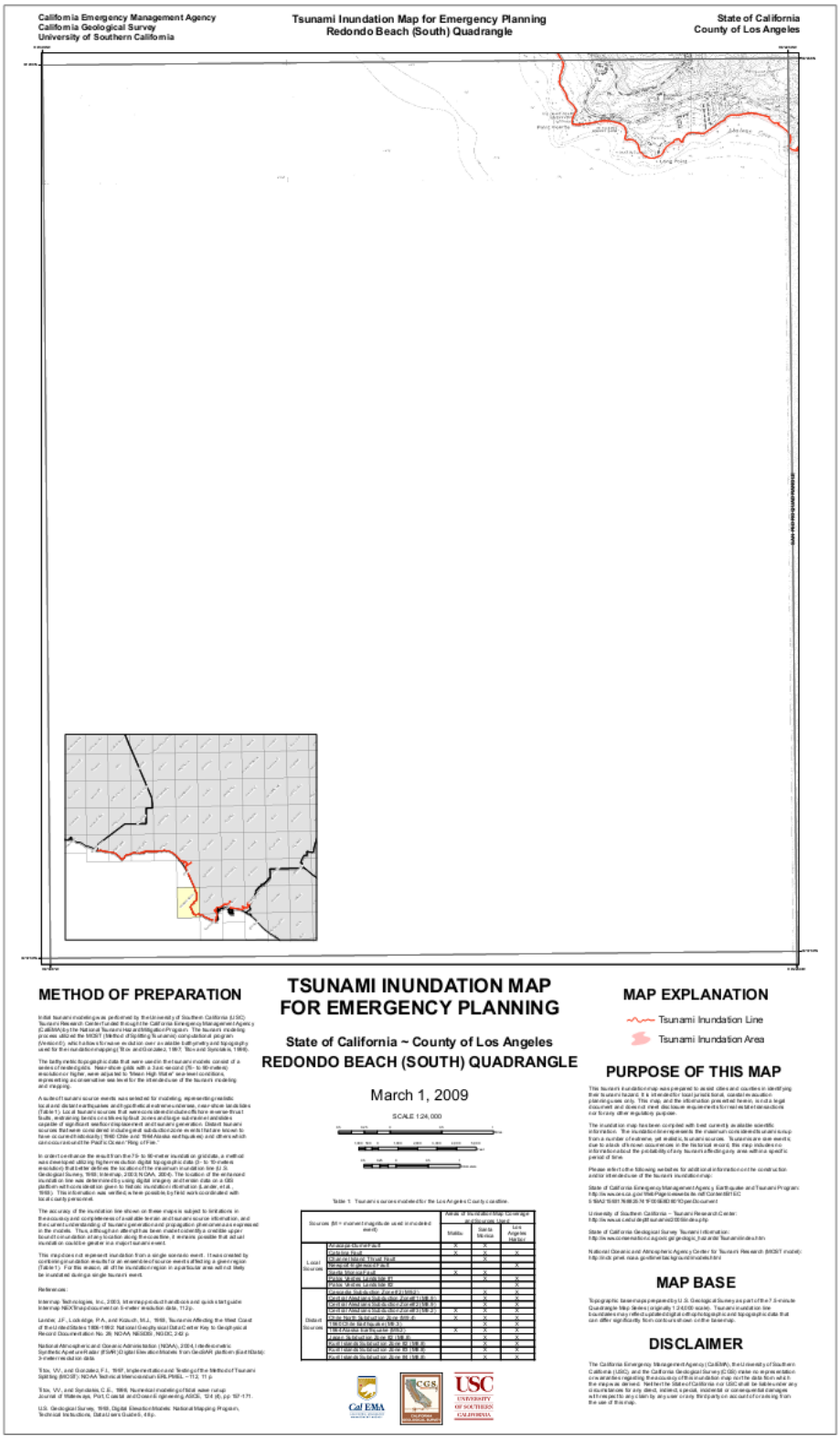
National Oceanic and Atmospheric Agency Center for Tsunami Research (MOST model): http://nctr.pmel.noaa.gov/time/background/models.html

MAP BASE

Topographic base maps prepared by U.S. Geological Survey as part of the 7.5-minute Quadrangle Map Series (originally 1:24,000 scale). Tsunami inundation line boundaries may reflect updated digital orthophotographic and topographic data that can differ significantly from contours shown on the base map.

DISCLAIMER

Map 7-2: Tsunami Inundation Map – Redondo Beach (South) Quadrangle (Source: State of California Department of Conservation)



California Emergency Management Agency
California Geological Survey
University of Southern California

Tsunami Inundation Map for Emergency Planning
Redondo Beach (South) Quadrangle

State of California
County of Los Angeles

METHOD OF PREPARATION

TSUNAMI INUNDATION MAP FOR EMERGENCY PLANNING

State of California ~ County of Los Angeles

REDONDO BEACH (SOUTH) QUADRANGLE

March 1, 2009

SCALE 1:24,000

MAP EXPLANATION

Tsunami Inundation Line

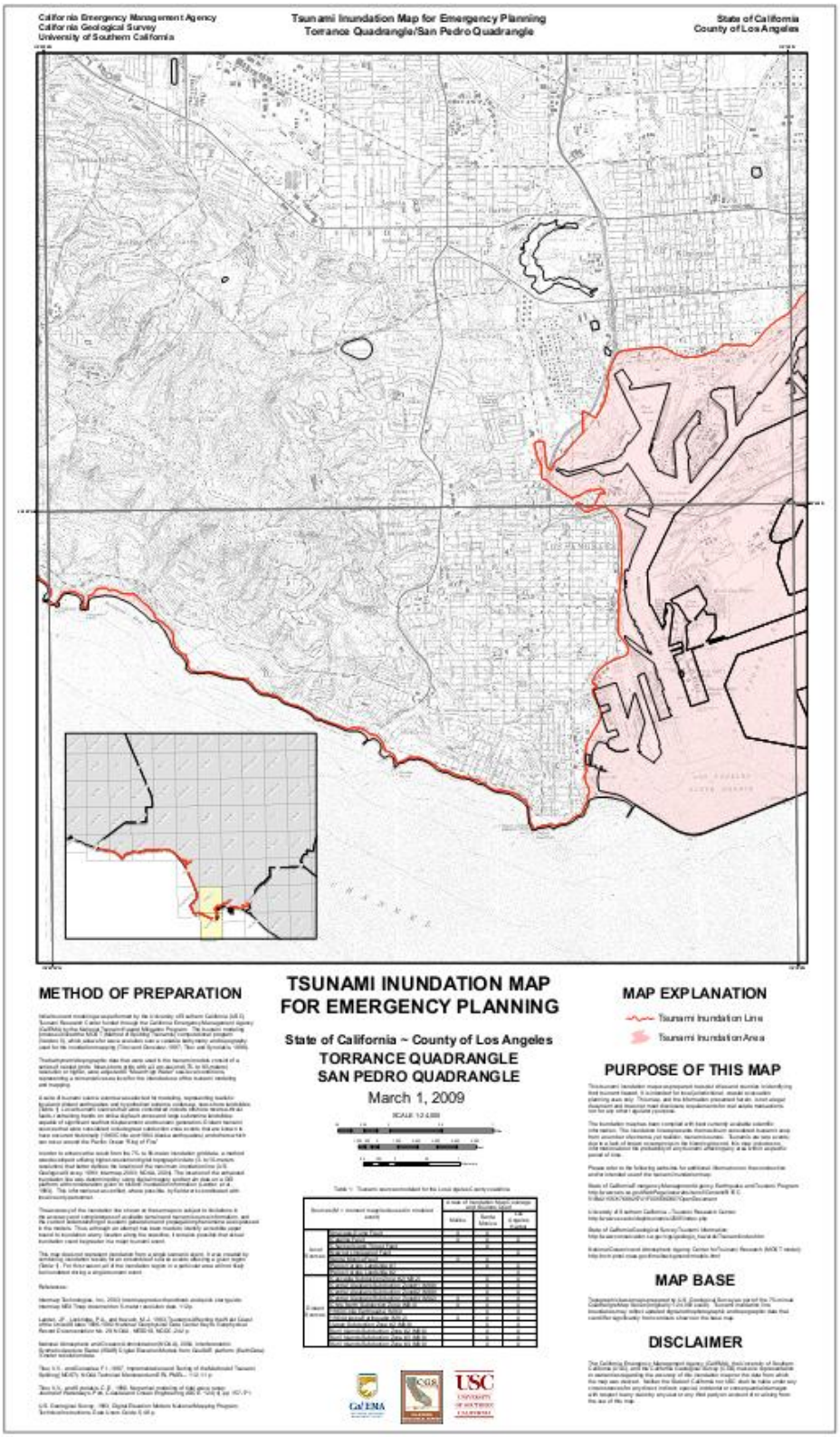
Tsunami Inundation Area

PURPOSE OF THIS MAP

MAP BASE

DISCLAIMER

Map 7-3: Tsunami Inundation Map – Torrance/San Pedro Quadrangle (Source: State of California Department of Conservation)



Life and Property

Considering the "local" history events of tsunamis and the predicted wave heights from a landslide induced tsunami in the San Pedro Channel, it can be concluded that the area seaward of Palos Verdes Drive South and Palos Verdes Drive West in the City of Rancho Palos Verdes would be heavily impacted by a tsunami event. According to the RPV Coastal Specific Plan (December 1978), this area contains 903 acres and represents approximately 10% of the City's land area. The largest impact on the community from a tsunami event would be from loss of life and property.

Residential

Residential property along the coast could also be devastated. City of Rancho Palos Verdes is an affluent community with expensive homes, especially for those located in the highly desirable area along the coastline. A large tsunami could potentially destroy or damage hundreds of homes situated along the bluff tops and spread debris throughout the coastal zone. Any residential structure with weak reinforcement would be susceptible to damage or could be impacted by significant coastal erosion.

Commercial

Throughout the year the coastline attracts a large number of visitors to the Trump National Golf Club. The Long Point property also consists of a 450-room resort hotel with conference center, spa and golf academy. Currently, the site is a popular location for large weddings and banquets and is frequently used for large-scale commercial filming. A tsunami event would impact these businesses by damaging property and by interrupting business and services. Any commercial structure with weak reinforcement would be susceptible to damage or could be impacted by significant coastal erosion.

Recreational

The Peninsula's picturesque coastline and marine resources is a public treasure. During the summer months, the City of Rancho Palos Verdes attracts a large number of visitors to its coastal parks and beaches. The City owns approximately 376 acres of parkland seaward of Palos Verdes Drive South and West. The types of development on these public parklands range in intensity from bluff top hiking trails to a regional interpretive museum. In addition, the City's offshore areas are popular for many types of marine recreational activities, including sun bathing, scuba diving, surfing, kayaking, fishing and sailing. If a tsunami were to occur on a peak holiday weekend, of example, it could devastate the entire coastal area and result in a significant loss of life.

Infrastructure

Tsunamis (and earthquakes) can damage buildings, power lines, and other property and infrastructure due to flooding. Tsunamis can result in collapsed or damaged buildings or blocked roads and bridges, damaged traffic signals, streetlights, and parks, among others. Damage to public water and sewer systems, transportation networks, and flood channels would greatly impact daily life for residents.

Roads blocked by objects during a tsunami may have severe consequences to people who are attempting to evacuate or who need emergency services. Emergency response operations can be complicated when roads are blocked or when power supplies are interrupted. Industry and

commerce can suffer losses from interruptions in electric services and from extended road closures. They can also sustain direct losses to buildings, personnel, and other vital equipment. There are direct consequences to the local economy resulting from tsunamis related to both physical damages and interrupted services.

Section 8: Technological and Human-caused Hazards

The following information is provided for educational purposes. Based on the Risk Assessment conducted by the Planning Team, Technological and Human-Caused Hazards were deemed to pose a "low" threat to the Planning Area. The following descriptions provide a general hazard identification, impacts from the hazards, and a brief discussion on local conditions.

Hazardous Materials Release

Hazard Identification

Virtually all sectors of the region's economy use materials that, if improperly stored, handled, transported, or disposed of, can create public health and environmental risks. Definitions of hazardous materials vary from source to source. The current descriptions used in Federal and State legislation include:

- A hazardous material is one that is ignitable, reactive, corrosive, toxic, or any combination of these properties (Resource Conservation and Recovery Act).
- A hazardous material is a substance or combination of substances which, because of its quantity, concentration or physical, chemical, or infectious characteristics may:
- Cause, or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or
- Pose a substantial present or potential hazard to humans or the environment (State Health and Safety Code, Chapter 6.5).
- A hazardous material is an injurious substance, including pesticides, herbicides, toxic metals and chemicals, liquefied material gas, explosives, volatile chemicals, and nuclear fuels (California Government Code).

Hazardous materials are typically stored in secured, on-site areas, in small containers or large aboveground or underground storage tanks.

Hazardous materials are transported throughout the region on a daily basis. The California Highway Patrol has designated the County's interstate system as hazardous materials transportation corridors; however surface streets are also used to transport hazardous materials from suppliers to customers. The California Highway Patrol is the primary regulatory authority for intrastate transport of hazardous materials.

The Federal Department of Transportation (DOT) is the primary regulatory authority for interstate transport of hazardous materials. DOT regulations establish criteria for safe handling procedures (e.g., packaging, marking, labeling, and routing). Criteria also exist regarding personnel qualifications, inspections, and equipment specifications.

Weather has many complex and important effects on the impact of hazardous material incidents. For instance, as wind increases in velocity, the plume or emissions from the incident increases. Likewise, precipitation (annual total, seasonal distribution and storm intensity) may increase the spread of hazardous materials. Both wind and precipitation may compound health concerns related to degraded air or water quality.

Impacts

Hazardous material incidents might conceivably cause the following issues:

- Potential for fires and explosions
- Disruption of transportation systems
- Need for highly specialized responders
- Destruction of utilities and other public services
- Damage to public infrastructure and facilities
- Residential displacement, including evacuations
- Individuals trapped and injured in unsafe conditions
- Health issues related to discharges or releases
- Need for emergency food, shelter, and medical care
- Economic impacts, both short and long-term
- Water pollution and quality degradation

Local Conditions

RPV/RHE does not have any heavy industry, which effectively limits the quantity of hazardous materials located in the Planning Area. The following locations, however, could subject the Planning Area to significant hazardous materials incidents:

1. Kaiser Medical Hospital – located along the Planning Area's north-eastern boundary
2. Pacific Coast Highway – arterial highway; potential transportation incidents
3. Interstate 110 – located east of the Planning Area; potential transportation incidents
4. Ports – Port of Los Angeles and Port of Long Beach; potential hazardous materials/terrorism/transportation incidents
5. Oil Refineries – located on Lomita Blvd; potential hazardous materials incident
6. LAX Airport – located north of the Planning Area; potential hazardous materials/terrorism/transportation incidents

The Planning Area is characterized by year-round mild to warm temperatures and light winds. The dominant wind pattern is daytime, offshore breezes from the northwest, occasionally broken by very strong Santa Ana winds from the northeasterly direction, resulting in wind velocities of up to 70 miles per hour. The Santa Ana winds typically occur during the autumn and winter months.

The predominant offshore breezes could assist in the dispersal of airborne pollutants; however an inversion layer of warm air occasionally overlaps the offshore breezes and may trap pollutants, particularly during the summer months. This phenomenon may compound health concerns related to degraded air quality.

Civil Disturbance

Hazard Identification

The spontaneous disruption of normal, orderly conduct and activities in urban areas, or the outbreak of rioting or violence that is of a large nature, is referred to as a civil disturbance. Civil disturbance can be spurred by specific events or can be the result of long-term displeasure with authority. Civil disturbance is usually distinguished by the need for outside assistance from law enforcement and/or fire services.

Civil disturbance may be precipitated or manifested in a number of ways, including but not limited to the following:

- Spontaneous reactions to verdicts in high-profile trials
- Spontaneous reactions to organized sporting event outcomes
- Organized reactions or demonstrations
- Targeting of public facilities
- Targeting of private highly visible establishments
- Local population demonstrations
- Transient population demonstrations
- Hit and run tactics
- Diversion tactics masking other motives
- Indiscriminate acts of arson and vandalism

While the motivation behind civil disturbance may be known, the exact extent and type of activity that will occur is less certain. During an outbreak of civil disturbance, the potential for multiple incidents is very high.

Impacts

- Significant injuries and deaths
- Potential for fires and explosions
- Potential for looting and theft
- Disruption of transportation systems
- Looting and widespread property theft
- Interference with law enforcement activities
- Destruction of utilities and other public services
- Damage to public infrastructure and facilities
- Residential displacement, including evacuations
- Individuals trapped and injured in unsafe conditions
- Need for emergency food, shelter, and medical care
- Economic impacts, both short and long-term

The threat to law enforcement and other responding personnel can be severe and bold in nature, due to the fervor and defiance of authority that typically accompanies acts of civil disturbance. Securing of critical infrastructure and services is necessary and may include a need for law enforcement escorts for maintenance and inspection crews.

Table 8-1: History of Civil Disturbances in Los Angeles County

Disturbance	Location	Date	Deaths	Injuries	Damage
Occupy Movement	Port of Long Beach	2011	0	0	N/A
Rodney King Riot	City of Los Angeles	1992	53	2300	N/A
Watts	South Central Los Angeles	1965	32	874	$45 million

Occupy Movement (2011)

The following is an excerpt from the Occupy Orange County (www.occupyorangecounty.com) website: "We are leaderless resistance movement in solidarity with Occupy Wall Street with people of many colors, genders and political persuasions. The one thing we all have in common is that We Are The 99% that will no longer tolerate the greed and corruption of the 1%. We are using the revolutionary Arab Spring tactic to achieve our ends and encourage the use of nonviolence to maximize the safety of all participants. We are in solidarity with the declaration made by Occupy Wall Street.

Our representation in government has been high jacked by those with the means to buy it from government officials. Our elected representatives should implement policies in support of the people instead of the powerful. The people must flex their power by punishing greedy and corrupt corporations and bankers with boycotts. The people should support businesses which conduct themselves with ethical integrity instead. The people must become informed and vote for government officials who are concerned with making real change instead of just being another cog in the greed machine. We are Occupy Orange County and we are committed to seeing change become reality. Join us and help us develop concrete steps towards solving the many problems we face.

We are the 99% and we DO exist in Orange County."

Rodney King Riot (1992)

On April 29, 1992, following the not guilty verdicts of four Los Angeles Police Officers accused of beating motorist Rodney King, violence erupted at the intersection of Florence and Normandie in South Los Angeles. At the same time, individuals at the corner of 67th Street and 11th Avenue were revolting against passer-bys and motorists. Black residents were outraged that four LAPD officers received not guilty verdicts from an all-white jury in Simi Valley, despite the videotape evidence of the beating of Rodney King, and the testimonial by veteran police officers on behalf of the prosecution. From April 29, 1992 at approximately 3:30 p.m. until May 1st, the violence raged on. The National Guard were called in to bring calm to the City, and by Friday afternoon the violence and looting were subdued. The most violent urban revolt that the United States had ever experienced in the twentieth century resulted in 52 deaths, 2,499 injuries, 6,559 arrests, 1,120 building damaged, 2,314 stores damaged and close to 1 billion in damages.

If we go back to 1992 and examine the precipitating factor of the riot, economics actually played a small role influencing the revolt. Yes, there was a recession in Los Angeles and around the country, unemployment was at an all-time high, high levels of poverty probably exacerbated the

riots that took place, but the critical events and underlying factors to the revolt were the beating of Rodney King in 1991, the probation sentence handed down on Sun Ja Doo, a Korean store clerk that shot Latasha Harlins, a 15 year old black girl, in the back of the head after a dispute over orange juice, and the acquittal of the four LAPD officers. In the Sun Ja Doo incident the jury came back with a second-degree murder conviction, but Judge Joyce Karlin, a white woman, did the unheard of when she sentenced Doo to five years probation. This is what I believe paved the way for the worst urban riot in contemporary history and the fact that over 50% of the damaged or destroyed property was Korean owned was no accident, and is the reason why many characterize this event as an uprising or a revolt. Although many of the images captured certainly show those acting as opportunists taking advantage of an unfortunate situation, at the same time there was an organized attack against Korean establishments within South LA and outside of the black community along Vermont and Western Avenues, north of the black community. Relations between blacks and Koreans in Los Angeles have often been full of tension and there is housing evidence that suggests that those tensions are still present in 2002.

The critical factors that influenced the events of April 29, 1992 all took place within the criminal justice sector of society with the police department central to the events. This is where he must look to address the question of a potential third Los Angeles riot. Chief Daryl Gates was held accountable for the type of relationship that was created between the police and minority communities in South LA and his response to the first day of the riot was considered dismal. Also let us not forget history, when in 1965 people took to the streets of Los Angeles in protest the day following alleged police abuses after the arrest of a Marquette Frye on 116th Street and Avalon. Chief William Parker was also highly criticized for the sharp divide that was created between the black community and the militaristic police, and resentment towards the police grew worse every year since Parker took over as Chief in 1950 up until the violence erupted in 1965. One indication of the increasing tension between the police and the community was the number of complaints that blacks filed between 1950 and 1965. Parker claimed no responsibility during a commission and when asked what sparked the riot he replied "someone threw a rock, and like monkeys in a zoo, they all started throwing rocks."

All of the seven race riots of 1964 were also sparked by an incident of police misconduct. The Otto Kerner Commission of 1968 stated that police actions led to outbreaks in half of the cases studied and those that believe that another revolt will take place will need to examine law enforcement and the criminal justice system. If the LAPD of LASD engage in any inappropriate activity such as excessive force or unlawful officer involved shootings, an outbreak of violence is definitely possible. Let us not forget what happened in Cincinnati in April 2001 when the shooting death of Timothy Thomas, 19, whose death touched off three days of riots. Cincinnati police officer Steven Roach was later found not guilty of negligent homicide in the shooting, but these are the types of events that will determine if Los Angeles will see part three. Under Bernard Parks inappropriate activity from the rank and file was highly unlikely with the disciplinary system that he had in place, but the actions of the next police chief may determine if what happened in 1965 and 1992 will occur again.

Watts Riot (1965)

The Watts Riot began on August 11, 1965 in Los Angeles, California when the Los Angeles Police pulled over Marquette Frye, whom they suspected of driving drunk. While police questioned Frye and his brother, a group of people began to gather around the scene. A struggle ensued shortly after Frye's mother Rena arrived on the scene, resulting in the arrest of all three family members. Police used their batons to subdue Frye and his brother, angering the growing crowd. Shortly after police left, tensions boiled over and the rioting began. What

followed was six days of rioting that claimed the lives of 34 people, injured 1,100 and caused estimated $100 million dollars damage.

One of the few structures in Watts that remained untouched by the damage was the Watts Towers, a group of tall steel sculptures constructed by Italian immigrant Sam Rodia (often erroneously called Simon Rodia).

Local Conditions

While there is no history of civil disturbance in the Planning Area, the Planning Team recognizes that there is a low possibility of civil disturbance in the future. As an example, it is conceivable that social protests could occur in the geographic vicinity of the oil refineries to the north of the Planning Area.

Terrorism

Hazard Identification

The United States Department of Justice defines terrorism as "the unlawful use of force or violence committed by a group or individual against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives."

Weapons of Mass Destruction (WMDs) are defined in Federal Government Code as any "explosive, incendiary, or poison gas, bomb, grenade, rocket having a propellant charge of more than four ounces, missile having an explosive or incendiary charge of more than one quarter ounce, mine or device similar to the above; poison gas; any weapon involving a disaster organism; or any weapon that is designed to release radiation or radioactivity at a level dangerous to human life." WMDs are usually classified according to the acronym C-B-R-N-E, or Chemical, Biological, Radiological, Nuclear, Explosive.

Chemical: Chemical agents are poisonous vapors, aerosols, liquids, and solids that have toxic effects on people, animals, or plants. They can be released by bombs or sprayed from aircraft, boats, and vehicles. They can be used as a liquid to create a hazard to people and the environment. Some chemical agents may be odorless and tasteless. They can have an immediate effect (a few seconds to a few minutes) or a delayed effect (two to 48 hours). While potentially lethal, chemical agents are difficult to produce and deliver in lethal concentrations. Outdoors, the agents often dissipate rapidly.

Biological: Biological agents are organisms or toxins that can kill or incapacitate people, livestock, and crops. The three basic groups of biological agents that would likely be used as weapons are bacteria, viruses, and toxins. Most biological agents are difficult to grow and maintain. Many break down quickly when exposed to sunlight and other environmental factors, while others, such as anthrax spores, are very long lived. Biological agents can be dispersed by spraying them into the air, by infecting animals that carry the disease to humans and by contaminating food and water.

Radiological: Terrorist use of a radiological dispersion device – often called a "dirty nuke" or "dirty bomb" – is considered far more likely than use of a nuclear explosive device. A RDD combines a conventional explosive device – such as a bomb – with radioactive material. It is designed to scatter dangerous and sub-lethal amounts of radioactive material over a general area. Such RDDs appeal to terrorists because they require limited technical knowledge to build

and deploy compared to a nuclear device. Also, the radioactive materials in RDDs are widely used in medicine, agriculture, industry, and research, and are easier to obtain than weapons grade uranium or plutonium.

Nuclear: A nuclear blast is an explosion with intense light and heat, a damaging pressure wave, and widespread radioactive material that can contaminate the air, water, and ground surfaces for miles around. A nuclear device can range from a weapon carried by a missile launched by a hostile nation or terrorist organization, to a small portable nuclear devise transported by an individual. All nuclear devices cause deadly effects when exploded, including blinding light, intense heat (thermal radiation), initial nuclear radiation, blast, and secondary fires caused by the destruction or a heat pulse.

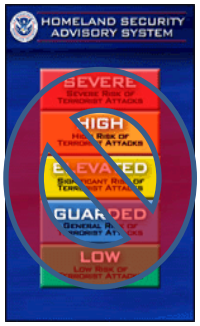
Explosives: Explosive devices are common terrorist weapons. Terrorists do not have to look far to find out how to make explosive devices; the information is readily available in books and other information sources. The materials needed for an explosive device can be found in many places including variety, hardware, and auto supply stores. Explosive devices are highly portable using vehicles and humans as a means of transport. They are easily detonated from remote locations or by suicide bombers.

Homeland Security Advisory System (HSA System): The HSA System is meant to guide the adoption of protective measures when specific information to a particular sector or region is received. The HSA System combines information on threats with vulnerability assessments and provides communications to public safety officials and the public.

- Homeland Security Threat Advisories (HSA Advisories): HSA Advisories contain actionable information about incidents involving, or threats targeting, critical national networks, infrastructure, or assets. HSA Advisories could, for example, relay newly developed procedures that, when implemented, would significantly improve security. They could also suggest a needed change in readiness posture, protective actions, or response. Advisories are targeted to Federal, state, and local governments, as well as private sector organizations and international partners.

- Homeland Security Information Bulletins (HIS Bulletins): HIS Bulletins communicate information of interest to the nation's critical infrastructures that do not meet the timeliness, specificity, or significance thresholds of warning messages. Information may include statistical reports, periodic summaries, incident response or reporting guidelines, common vulnerabilities, and configuration standards or tools. It also may include preliminary requests for information. Bulletins are targeted to Federal, state, and local governments, as well as private organizations and international partners.

- The National Terrorism Advisory System, or NTAS, replaces the color-coded Homeland Security Advisory System (HSAS). This new system will more effectively communicate information about terrorist threats by providing timely, detailed information to the public, government agencies, first responders, airports and other transportation hubs, and the private sector. These alerts will include a clear statement that there is an *imminent threat* or *elevated threat*. Using available information, the alerts will provide a concise summary of the potential threat, information about actions being taken to ensure public safety, and recommended steps that individuals, communities, businesses and governments can take to help prevent, mitigate or respond to the threat.



Imminent Threat Alert

Warns of a credible, specific, and impending terrorist threat against the United States.

Elevated Threat Alert

Warns of a credible terrorist threat against the United States.

Like the Los Angeles County Operational Area, the Cities have chosen to take a broad approach to terrorism planning, instead of developing specific plans for each potential terrorist target. Nationwide experience demonstrates that there are no longer targets or population groups that are "off limits" to terrorists.

Impacts

Terrorism incidents might conceivably cause the following impacts:

- Significant injuries and deaths
- Potential for fires and explosions
- Disruption of transportation systems
- Interference with law enforcement activities
- Destruction of utilities and other public services
- Damage to public infrastructure and facilities
- Residential displacement, including evacuations
- Individuals trapped and injured in unsafe conditions
- Need for emergency food, shelter, and medical care
- Economic impacts, both short and long-term
- Need for highly specialized responders
- Health issues related to discharges or releases
- Water pollution and quality degradation

Local Conditions

Throughout California and Los Angeles County there is a nearly limitless number of potential terrorist targets, including government facilities; schools; religious institutions; gathering places (shopping centers, entertainment venues, etc.); abortion clinics; power plants and other utility infrastructure; transportation infrastructure; oil refineries, water storage facilities; locations of high profile individuals; and, financial institutions. The Planning Area contains many of the aforementioned potential terrorist targets and is located nearby a multitude of others.

Epidemic/Pandemic

Hazard Identification

Vaccines, antibiotics, and improved living conditions resulted in dramatic declines in communicable diseases in the latter part of the 20th Century. However, infectious diseases

have become an increasing threat to all persons in Los Angeles County due to a variety of factors such as: population growth (overcrowding, aging, migration), methods of food production (large scale, wide distribution, importation), environmental changes (drought, encroachment of humans on wild areas, global warming), microbial adaptation (resistance to antibiotics, re-assortment of genetic material), changes in health care (drugs causing immunosuppression, widespread use of antibiotics), and human behavior (travel, diet, sexual behavior, compromised immune systems).

Problems (infection or illness) would be identified by a variety of entities:

- ✓ Clinicians (urgent care, hospitals, clinics)
- ✓ Pharmacists
- ✓ Veterinarians
- ✓ Animal Control
- ✓ Vector Control
- ✓ Emergency medical personnel (first responders, EMT's, Paramedics, ER personnel)
- ✓ Laboratorians
- ✓ Pathologists
- ✓ Coroner

Current epidemic threats include:

- ✓ **West Nile Virus**
  - Mosquitoes spread this virus. A small proportion of persons infected develop systems, which can range from fever and body aches to encephalitis. West Nile Virus was first detected in the United States in New York City in 1999 and has moved westward in subsequent years, causing epidemics across the country.
- ✓ **Antibiotic-resistant microorganisms**
  - Widespread and improper use of antibiotics and insufficient use of control measures has resulted in resistance to antibiotics. Methicillin-resistant Staphylococcus aureus (MRSA) has become resistant to many other antibiotics and a new strain recently began circulating in the community.
- ✓ **Pandemic influenza**
  - 'Pandemic' refers to a worldwide epidemic. New influenza strains with pandemic potential can appear when animal and human strains have the opportunity to exchange genetic material resulting in a virulent strain that can infect humans. This could happen at any time.
- ✓ **Reemergence of Severe Acute Respiratory Syndrome (SARS)**
  - SARS likely emerged from an animal or animals in China to infect humans. Reemergence could occur at any time, since the actual source is unknown and cannot be eradicated.
- ✓ **Food borne illness**
  - Contaminated food sources and human error can cause food borne outbreaks. Small food borne outbreaks occur frequently.
- ✓ **Bioterrorism**
  - The diseases of greatest concern include anthrax, smallpox, plague, tularemia, botulism, and viral hemorrhagic fevers.

Impact

- ✓ Injury and loss of life
- ✓ Commercial and residential structural damage
- ✓ Disruption of and damage to public infrastructure
- ✓ Secondary Health hazards e.g., mold and mildew
- ✓ Damage to roads/bridges resulting in loss of mobility
- ✓ Significant economic impact (jobs, sales, tax revenue) upon the community
- ✓ Negative impact on commercial and residential property values
- ✓ Significant disruption to students and teachers as temporary facilities and relocations are needed

Local Conditions

Because of the nature of epidemic and pandemic hazards it is difficult to identify specific locations or populations clusters that would be vulnerable to a particular hazardous event. As such, no specific infrastructure, government structure, population centers have been identified as being targets or at any greater risk than any other location.

Energy Shortage

Hazard Identification

Loss of electrical services would mean a potential life-threatening situation in the case of electricity for medically dependent residents, and a public health threat if the services are disrupted for some time due to accidental or terrorist acts.

An energy shortage is any interruption or loss of electrical service due to disruption of power generation or transmission caused by an accident, sabotage, natural hazards, equipment failure, or fuel shortage. These interruptions can last anywhere from a few seconds to several days. Energy Shortages are considered significant only if the local Emergency Management Organization is required to coordinate basic services such as the provision of food, water, and heating as a result. Energy Shortages are common with severe weather and winter storm activity.

The massive 2011 Southern California electricity outage brought to light many critical issues surrounding the state's power generation and distribution system, including its dependency on out-of-state resources. Although California has implemented effective energy conservation programs, the state continues to experience both population growth and weather cycles that contribute to a heavy demand for power.

Hydro-generation provides approximately 25% of California's electric power, with the balance coming from fossil fuels, nuclear, and green sources. As experienced in 2000 and 2001, blackouts can occur due to losses in transmission or generation and/or extremely severe temperatures that lead to heavy electric power consumption.

Impact

- ✓ Injury and loss of life
- ✓ Disruption of and damage to public infrastructure (particularly water distribution and sewer management)
- ✓ Secondary Health hazards e.g., mold and mildew
- ✓ Economic impacts (jobs, sales, tax revenue) upon the community
- ✓ Significant disruption to population centers
- ✓ Dangerous threats posed to health care facilities
- ✓ Disruption to delivery of emergency services

Local Conditions

The effects of an energy shortage would affect all occupants of the Planning Area. Perhaps most at risk would be medically challenged individuals with health care equipment reliant on electricity (e.g. oxygen), businesses, emergency service locations, and vulnerable populations center (e.g. schools).

Radiological Accidents

Hazard Identification

There are two operating nuclear power plants (NPP) in California: the Diablo Canyon Power Plant in San Luis Obispo County, and the San Onofre Nuclear Generating Station (SONGS) in San Diego County. Two other nuclear power plants, Humboldt Bay and Rancho Seco, are not operational, but have spent fuel stored on-site.

The Planning Area is approximately 55 miles north of SONGS. There are three emergency zones established around SONGS to educate and, if necessary, evacuate the people who live and work near the plant. The zones are: the Emergency Planning Zone (10-mile radius), the Public Education Zone (20-mile radius), and the Ingestion Pathway Zone (50-mile radius). Given the distance of the Planning Area from SONGS, it does not fall within any of the SONGS emergency zones.

Transportation Accidents

Hazard Identification

Ports

The Port of Long Beach, also known as Long Beach's Harbor Department, is the second busiest container port in the USA after the Port of Los Angeles, which it adjoins. Acting as a major gateway for U.S.-Asian trade, the port occupies 3,200 acres of land with 25 miles of waterfront in the City of Long Beach.

Airplane Accidents

Airline accidents are listed as a "low" threat because the number of deaths and extent of property damage is considerably less than say, a large earthquake. Following is a summary of the airplane accidents that have happened since 1987 in the region.

Table 8-2: Historic Airplane Accidents in Southern California (Source: http://www.ntsb.gov/aviationquery/index.aspx)

Event Date	Probable Cause Released	Location	Make / Model	Event Severity	Type of Air Carrier Operation and Carrier Name (Doing Business As)
12/7/1987	1/4/1989	San Luis Obispo	British Aerospace BAE-146-200	Fatal (43)	SCHD Pacific Southwest Airlines
2/1/1991	8/5/1993	Los Angeles	Boeing 737-300	Fatal (34)	SCHD USAir
1/31/2000	5/29/2003	Port Hueneme	Douglas MD-83	Fatal(88)	SCHD Alaska Airlines Inc.
2/16/2000	9/17/2003	Rancho Cordova	Douglas DC-8-71F	Fatal (3)	NSCH Part 121: Air Carrier Emery Worldwide Airlines Inc.

A major air crash that occurs in a heavily populated area can result in considerable loss of life and property. The impact of a disabled aircraft as it strikes the ground creates the likely potential for multiple explosions, resulting in intense fires. Regardless of where the crash occurs, the resulting explosions and fires have the potential to cause injuries, fatalities and the destruction of property at and adjacent to the impact point. The time of day when the crash occurs may also have a profound effect on the number of dead and injured.

Local Conditions

The skies above the Planning Area are heavily occupied by aircraft originating and departing from a number of airports located in the region. The airports nearest the Planning Area which handle the greatest amount of air traffic are as follows:

- Los Angeles International Airport (LAX): as of 2012 was ranked as the 3rd busiest airport in the United States.
- Long Beach Municipal Airport (LGB): as of 2009 was ranked as the 26th busiest airport in the United States.
- Zamperini Field (TOA): is a City-owned (Torrance) public use airport.

Water Shortage

Hazard Identification

In light of the fact Planning Area residents and businesses rely on imported water, it's impossible to separate drought from water supply shortages. Drought is defined as a deficiency of precipitation over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group, or environmental sector. Drought should be considered relative to some long-term average condition of balance between precipitation and evapotranspiration (i.e., evaporation + transpiration) in a particular area, a condition often perceived as "normal". It is also related to the timing (e.g., principal season of occurrence,

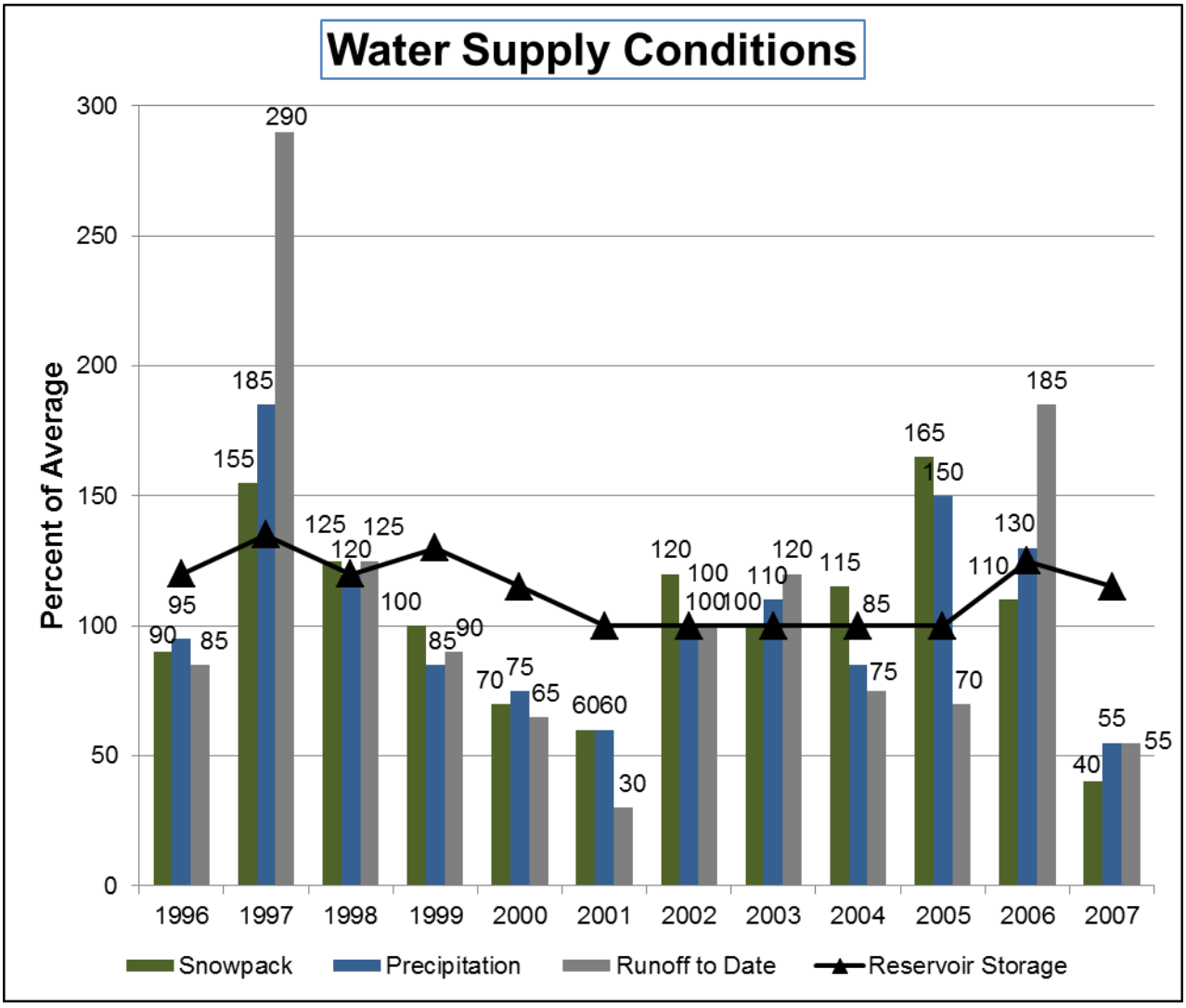
delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness of the rains (e.g., rainfall intensity, number of rainfall events).

Other climatic factors such as high temperature, high wind, and low relative humidity are often associated with it in many regions of the world and can significantly aggravate its severity. Drought should not be viewed as merely a physical phenomenon or natural event. Its impacts on society result from the interplay between a natural event (less precipitation than expected resulting from natural climatic variability) and the demand people place on water supply. Human beings often exacerbate the impact of drought. Recent droughts in both developing and developed countries and the resulting economic and environmental impacts and personal hardships have underscored the vulnerability of all societies to this natural hazard.

One dry year does not normally constitute a drought in California, but serves as a reminder of the need to plan for droughts. California's extensive system of water supply infrastructure — its reservoirs, groundwater basins, and inter-regional conveyance facilities — mitigates the effect of short-term dry periods for most water users. Defining when a drought begins is a function of drought impacts to water users. Hydrologic conditions constituting a drought for water users in one location may not constitute a drought for water users elsewhere, or for water users having a different water supply. Individual water suppliers may use criteria such as rainfall/runoff, amount of water in storage, or expected supply from a water wholesaler to define their water supply conditions.

Figure 8-1: Water Supply Conditions below illustrates several indicators commonly used to evaluate California water conditions. The percent of average values are determined for measurement sites and reservoirs in each of the State's ten major hydrologic regions. Snow pack is an important indicator of runoff from Sierra Nevada watersheds, the source of much of California's developed water supply.

Figure 8-1: Water Supply Conditions
(Source: California Department of Water Resources)



Drought is a gradual phenomenon. Although droughts are sometimes characterized as emergencies, they differ from typical emergency events. Most natural disasters, such as floods or forest fires, occur relatively rapidly and afford little time for preparing for disaster response. Droughts occur slowly, over a multiyear period. There is no universal definition of when a drought begins or ends. Impacts of drought are typically felt first by those most reliant on annual rainfall -- ranchers engaged in dry land grazing, rural residents relying on wells in low-yield rock formations, or small water systems lacking a reliable source. Criteria used to identify statewide drought conditions do not address these localized impacts. Drought impacts increase with the length of a drought, as carry-over supplies in reservoirs are depleted and water levels in groundwater basins decline.

There are four different ways that drought can be defined:

1) **Meteorological** - a measure of departure of precipitation from normal. Due to climatic differences what is considered a drought in one location may not be a drought in another location.
2) **Agricultural** - refers to a situation when the amount of moisture in the soil no longer meets the needs of a particular crop.
3) **Hydrological** - occurs when surface and subsurface water supplies are below normal.
4) **Socioeconomic** - refers to the situation that occurs when physical water shortage begins to affect people.

Impact

- ✓ Health complications from limited or use of non-potable water
- ✓ Disruption of and damage to public infrastructure (contamination to water distribution systems, blockages in sewer system)
- ✓ Loss to governments, commercial, and residential properties of landscaping materials
- ✓ Economic impacts (jobs, sales, tax revenue) upon the community
- ✓ Added cost of bottled and other water sources
- ✓ Compromises to hygiene
- ✓ Dangerous threats posed to health care facilities
- ✓ Disruption to delivery of emergency services (e.g. firefighting)

Local Conditions

The Planning Team identified concerns regarding water shortage due to the fact that the peninsula's water is pumped uphill through an array of complicated water lines and pumps. In the event of a catastrophic disaster, Cal Water predicts it would only have 1 to 2 days of water supply for the peninsula. Cal Water would be able to sustain a low flow as long as they could retain power.

Natural Gas Pipeline Incidents

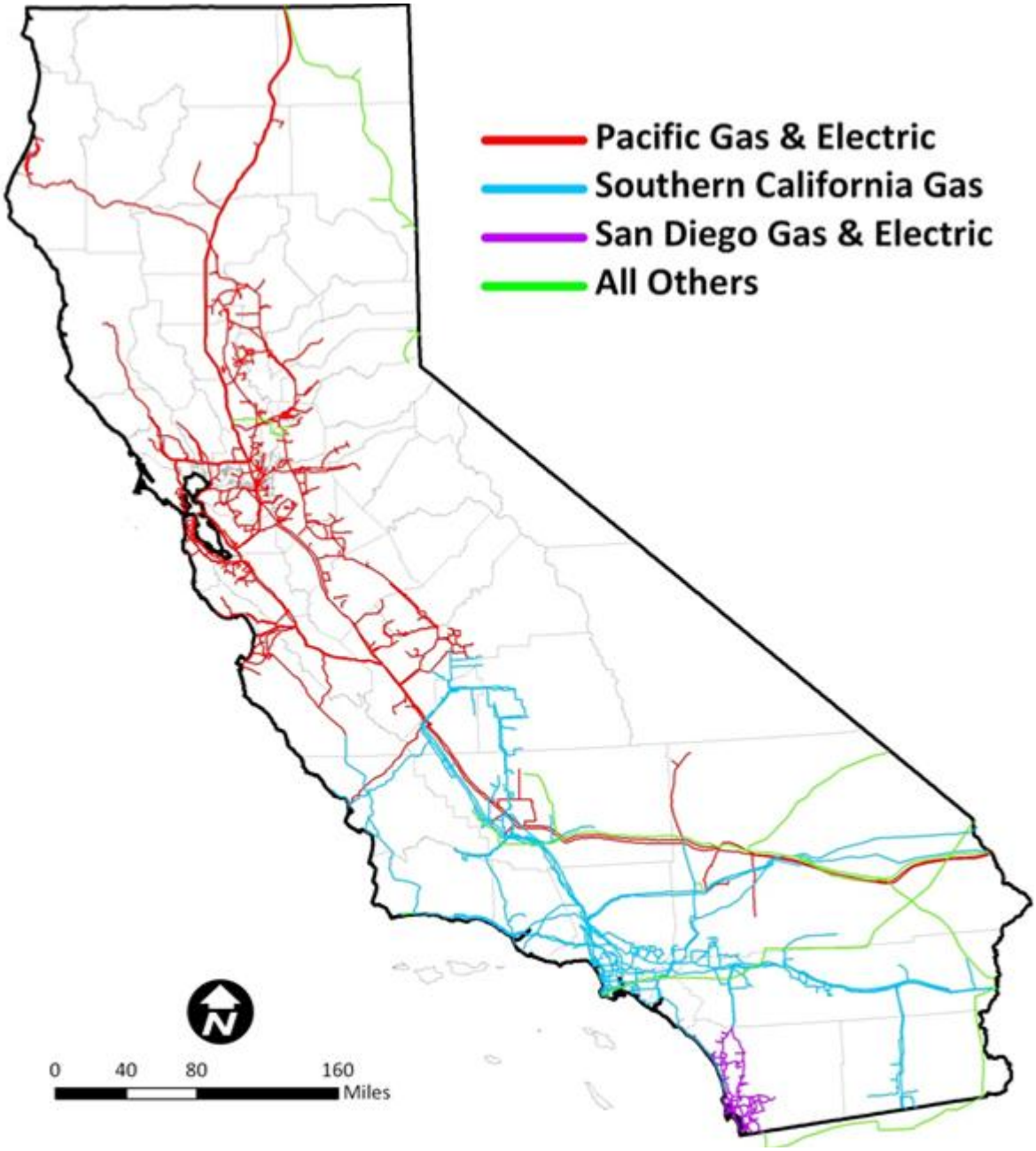
Hazard Identification

Virtually all natural gas, which accounts for about 28 percent of energy consumed annually, is transported by transmission pipelines. Although California is a leader in exploring and implementing alternative energy sources such as wind and solar, the expansion of traditional energy sources, such as natural gas, continues.

Compounding the potential risk is the age and gradual deteriorating of the gas transmission system due to natural causes. Significant failure, including pipe breaks and explosions, can result in loss of life, injury, property damage, and environmental impacts. Causes of and contributors to pipeline failures include construction errors, material defects, internal and external corrosion, operational errors, control system malfunctions, outside force damage, subsidence, and seismicity. Growth in population, urbanization, and land development near transmission pipelines, together with addition of new facilities to meet new demands, may increase the likelihood of pipeline damage due to human activity and the exposure of people and property to pipeline failures.

Map 8-1 shows the location and ownership of the natural gas pipeline system. Many of the pipelines are located in areas with high seismic activity, crossing the San Andreas and other active faults.

Map 8-1 California Natural Gas Pipeline Systems
(Source: California Energy Commission, http://www.energy.ca.gov/maps/Natural_Gas_Pipelines.pdf)



Generally speaking, transmission lines are large-diameter steel pipes carrying natural gas at high pressure and compressed to provide higher carrying capacity. Transmission lines are both interstate and intrastate, with the latter connecting to smaller distribution lines delivering gas directly to homes and businesses. Data compiled by the Pipeline and Hazardous Materials Safety Administration (PHMSA) report a total of 115,291 miles of gas pipelines in California, of which 12,414 are classified as gas transmission lines, 403 are gas-gathering lines, and the majority, 102,475, are for gas distribution. Nearly 40 percent of gas transmission lines are located in Los Angeles, Kern, and San Bernardino counties.

San Bruno Gas Transmission Line Explosion

On September 9, 2010, a 30-inch steel natural gas transmission pipeline owned and operated by PG&E ruptured and exploded in the City of San Bruno residential neighborhood. The blast and ensuing inferno resulted in 8 confirmed deaths, 66 reported injuries, 34 destroyed structures, and 8 damaged structures. Cal OES has identified preliminary damage estimates at $15.4 million, including $2.5 million for debris removal, $10.2 million for protective measures, $2.1 million for roads and bridges, and $0.6 million for utilities and other facilities. Investigations into the cause of the explosion are under way by the National Safety Transportation Board (NSTB), the California Public Utilities Commission (CPUC), and PG&E. Although it will not be confirmed until official investigations are completed, initial speculation points to the weakening of the 60-year-old pipeline due to corrosion. The day after the explosion, the CPUC asked PG&E to provide a list of its top 100 high-priority projects to upgrade or replace portions of the pipeline for reasons of public safety, as well as information on the status of listed projects. The list was published on September 21, 2010. Although targeted for repair several years ago, the San Bruno pipeline was not on the list.

Impact

- ✓ Injury and loss of life
- ✓ Catastrophic damage to natural gas pipe
- ✓ Disruption of and damage to public infrastructure
- ✓ Damage to roads and bridges
- ✓ Secondary fires and explosions
- ✓ Economic impacts (jobs, sales, tax revenue) upon the community
- ✓ Significant demands on emergency services

Local Conditions

There are natural gas transmission pipelines within the Planning Area, as well as adjoining communities.

PART III: MITIGATION STRATEGIES

Section 9: Mitigation Strategies

Overview of Mitigation Strategy

As the cost of damage from disasters continues to increase nationwide, the Cities recognize the importance of identifying effective ways to reduce vulnerability to disasters. Hazard mitigation plans assist communities in reducing risk from hazards by identifying resources, information, and strategies for risk reduction, while helping to guide and coordinate mitigation activities throughout the Cities.

The Plan provides a set of action items to reduce risk from hazards such as education and outreach programs and the development of partnerships. The Plan also provides for the implementation of preventative activities, including programs that restrict and control development in areas subject to damage from natural hazards.

The resources and information within the Plan:

- ✓ Establish a basis for coordination and collaboration among agencies and the public in RPV/RHE
- ✓ Identify and prioritize future mitigation projects
- ✓ Assist in meeting the requirements of federal assistance programs

The Plan works in conjunction with other City plans, including Multi-Hazard Functional Plans.

Planning Approach

The four-step planning approach outlined in the FEMA publication, *Developing the Mitigation Plan: Identifying Mitigation Actions and Implementing Strategies* (FEMA 386-3) was used to develop this plan:

- ✓ **Develop mitigation goals and objectives -** The risk assessment (hazard characteristics, inventory, and findings), along with municipal policy documents, were utilized to develop mitigation goals and objectives.
- ✓ **Identify and prioritize mitigation actions -** Based on the risk assessment, goals and objectives, existing literature/resources, and input from participating entities, mitigation activities were identified for each hazard. Activities were: 1) qualitatively evaluated against the goals and objectives, and other criteria; 2) identified as high, medium, or low priority; and 3) presented in a series of hazard-specific tables.
- ✓ **Prepare implementation strategy -** Generally, high priority activities are recommended for implementation first.

  However, based on community needs and goals, project costs, and available funding, some medium or low priority activities may be implemented before some high priority items.
- ✓ **Document mitigation planning process -** The mitigation planning process is documented throughout this plan.

Mitigation Measure Categories

Following is FEMA's list of mitigation categories. The activities identified by the Planning Team are consistent with the six broad categories of mitigation actions outlined in FEMA publication 386-3 *Developing the Mitigation Plan: Identifying Mitigation Actions and Implementing Strategies*.

- ✓ **Prevention:** Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.
- ✓ **Property Protection:** Actions that involve modification of existing buildings or structures to protect them from a hazard, or removal from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.
- ✓ **Public Education and Awareness:** Actions to inform and educate citizens, property owners, and elected officials about hazards and potential ways to mitigate them.

  Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.
- ✓ **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses preserve or restore the functions of natural systems. Examples include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- ✓ **Emergency Services:** Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.
- ✓ **Structural Projects:** Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, retaining walls, and safe rooms.

Goals*

The Planning Team developed mitigation goals to avoid or reduce long-term vulnerabilities to natural hazards. These general principles clarify desired outcomes.

The goals are based on the risk assessment and Planning Team input, and represents a long-term vision for hazard reduction or enhanced mitigation capabilities. They are compatible with community needs and goals expressed in other planning documents prepared by the Cities.

Each goal is supported by mitigation action items. The Planning Team developed these action items through its knowledge of the local area, risk assessment, review of past efforts, identification of mitigation activities, and qualitative analysis.

*** ELEMENT C. MITIGATION STRATEGY | C3**

C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))

The five mitigation goals and descriptions are listed below.

Protect Life and Property

Implement activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to losses from hazards.

Improve hazard assessment information to make recommendations for avoiding new development in high hazard areas and encouraging preventative measures for existing development in areas vulnerable to hazards.

Enhance Public Awareness

Develop and implement education and outreach programs to increase public awareness of the risks associated with hazards.

Provide information on tools; partnership opportunities, and funding resources to assist in implementing mitigation activities.

FEMA defines **Goals** as general guidelines that explain what you want to achieve. They are usually broad policy-type statements, long-term, and represent global visions.

Preserve Natural Systems

Support management and land use planning practices with hazard mitigation to protect life.

Preserve, rehabilitate, and enhance natural systems to serve hazard mitigation functions.

FEMA defines **Mitigation Activities** as specific actions that help you achieve your goals and objectives.

Encourage Partnerships and Implementation

Strengthen communication and coordinate participation with public agencies, citizens, non-profit organizations, business, and industry to support implementation.

Encourage leadership within the Cities and public organizations to prioritize and implement local and regional hazard mitigation activities.

Strengthen Emergency Services

Establish policy to ensure mitigation projects for critical facilities, services, and infrastructure.

Strengthen emergency operations by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.

Coordinate and integrate hazard mitigation activities where appropriate, with emergency operations plans and procedures.

The Planning Team also developed hazard-specific mitigation goals, which appear in Section 9: Mitigation Strategies.

Public Participation*

Public input during development of the Plan assisted in creating plan goals. Meetings and follow-on discussions with the Planning Team members yielded historical information on hazard events, status updates on the identified mitigation action items, action item priorities, and new action items.

In addition to the Planning Team, other public input was solicited through both City websites.

Following is a brief description of the dates and content of Public meetings associated with the Plans adoption process. (Note: to be inserted following the public review process)

How are the Mitigation Action Items Organized?

The Planning Team chose to separate the Mitigation Action Item Matrices because the process of implementing a shared matrix is impractical.

The action items are a listing of activities in which City agencies and citizens can be engaged to reduce risk. Each action item includes an estimate of the timeline for implementation.

The action items are organized within the following Mitigation Actions Matrix, which lists all of the multi-hazard (actions that reduce risks for more than one specific hazard) and hazard-specific action items included in the Plan. Data collection and research and the public participation process resulted in the development of these action items (Section 10: Planning Process). Each Matrix includes the following information for each action item:

Funding Source

The action items can be funded through a variety of sources, possibly including: operating budget/general fund, development fees, Community Development Block Grant (CDBG), Hazard Mitigation Grant Program (HMGP), other Grants, private funding, Capital Improvement Plan, and other funding opportunities.

Coordinating Organization

The Mitigation Actions Matrix (Table 9-2) assigns primary responsibility for each of the action items. The hierarchies of the assignments vary – some are positions, others departments, and other committees. The primary responsibility for implementing the action items falls to the entity shown as the "Coordinating Organization". The coordinating organization is the agency with regulatory responsibility to address hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring, and evaluation. Coordinating organizations may include local, county, or regional agencies that are capable of or responsible for implementing activities and programs.

*** ELEMENT A: PLANNING PROCESS | A3**

A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))

Plan Goals Addressed

The plan goals addressed by each action item are included as a way to monitor and evaluate how well the Plan is achieving its goals once implementation begins.

The plan goals are organized into the following five areas:

- ✓ Protect Life and Property
- ✓ Enhance Public Awareness
- ✓ Preserve Natural Systems
- ✓ Encourage Partnerships and Implementation
- ✓ Strengthen Emergency Services

Comments

Planning Team department representatives provided status updates on each of the mitigation action items identified in the 2004 Plan. The status was indicated in the comments column using the following categories: New, Revised, Completed, Deleted, and Deferred.

*Ranking Priorities**

To assist with implementing the Plan, the Planning Team adopted the following process for ranking mitigation action items. Designations of "High," "Medium," and "Low" priority have been assigned to each action item using the following criteria:

Does the Action:

- solve the problem?
- address Vulnerability Assessment?
- reduce the exposure or vulnerability to the highest priority hazard?
- address multiple hazards?
- benefits equal or exceed costs?
- implement a goal, policy, or project identified in the General Plan or Capital Improvement Plan?

Can the Action:

- be implemented with existing funds?
- be implemented by existing state or federal grant programs?
- be completed within the 5-year life cycle of the LHMP?
- be implemented with currently available technologies?

Will the Action:

- be accepted by the community?
- be supported by community leaders?
- adversely impact segments of the population or neighborhoods?
- require a change in local ordinances or zoning laws?
- positive or neutral impact on the environment?
- comply with all local, state and federal environmental laws and regulations?

Is there:

- sufficient staffing to undertake the project?
- existing authority to undertake the project?

During the prioritization meeting of the Planning Team, department representatives were provided worksheets for each of their assigned action items. Answers to the criteria above determined the priority according to the following scale.

- 1-6 = Low priority
- 7-12 = Medium priority
- 13-18 = High priority

*** ELEMENT C. MITIGATION STRATEGY | C5**

C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))

The General Plans

The Planning Team went to great lengths to examine the various regulatory documents influencing the community's ability to mitigate against the identified hazards. Perhaps, the most important of these documents was the General Plan for both cities. It is the intention of the Planning Team to link the Plan actions items as closely as possible to the General Plans. The purpose of this association is that many development projects require a determination of "General Plan conformity" prior to approval. If the Plan and General Plans are aligned, this will better ensure both the sustainability and implementation of the Plan. Since the establishment of the DMA 2000 regulations, FEMA and other regulators have been frustrated by the ineffectiveness of Plan implementation – in other words, the failure of plans to actually affect the built environment and cause a reduction in risk. The Planning Team believes that changing the circle of build-damage-rebuild can most effectively be broken by linking the Plan to the regulations and policy guidelines that allow for construction and land use.

Following are lists of mitigation-related policies drawn from each of the Cities' General Plans.

City of Rancho Palos Verdes: General Plan Policies

Safety Element:

1: Promote education and safety awareness pertaining to all hazards which affect RPV residents and adjacent communities.

2: Adopt and enforce building codes, ordinances, and regulations using best practices which contain design and construction standards based upon appropriate levels of risk and hazard.

3: Encourage cooperation among adjacent communities to ensure law enforcement and fire protection mutual aid in emergency situations.

4: Cooperate with the fire protection agency and water company to ensure adequate water flow capabilities with adequate back-up throughout all areas of the City.

5: Continue to cooperate with fire protection agencies in utilizing public facilities for water and refueling location.

6: Develop and implement site design and maintenance criteria for areas of high fire hazard potential in coordination with fire protection agencies.

7: Implement reasonable and consistent house numbering and street naming systems.

8: Coordinate with the Fire Department to provide adequate emergency access to all streets, including the end points of cul-de-sacs, and along the sides of structures.

9: Ensure that services are available to adequately address health and sanitation issues.

10: Work with other jurisdictions to ensure that local, County, State, and Federal health, safety, and sanitation laws are enforced.

11: Develop and maintain relationships with the various levels of health, safety and sanitation agencies.

12: Ensure the availability of paramedic rescue and fire suppression services to all areas of the City.

13: Maintain and implement a current Standard Emergency Management Systems (SEMS) Plan to cope with major disasters.

Safety Element:

Goal 1: The City will work with the County to ensure that critical structures remain safe and functional in the event of a disaster.

Policy 1.1 Ensure that existing critical and semi-critical structures throughout the City meet seismic safety standards within ten years and that new facilities are developed to upgraded standards.

Policy 1.2 Designate and develop specific critical facilities as emergency centers to serve the entire City and work with other Cities to maintain existing trauma care facilities that serve the region.

Policy 1.3 Work with the County to ensure that all fire equipment remains operable and adequate to respond to a major disaster.

Policy 1.4 Cooperate with the Los Angeles County Sheriff's Department to ensure that law enforcement services are ready and available to serve the City in the event of a major disaster.

Policy 1.5 Support earthquake strengthening and provision of alternative or backup services, such as water, sewer, electricity, and natural gas pipelines and connections, especially in areas of high seismic or geologic high hazard or where weak segments are identified by existing or future studies.

Policy 1.6 Enforce seismic design provisions for Seismic Zone 4 of the Uniform Building Code to ensure adequate review and inspection to ensure that stairways and elevators are adequately strengthened and nonstructural components such as emergency generators, water beaters, computers, and cabinets are securely anchored in critical facilities.

Policy 1.7 Require fault investigations along traces of the Palos Verdes and Cabrillo faults to comply with guidelines implemented by the Alquist-Priolo Special Studies Zone Act. Buildings for human occupancy should be setback a minimum of 50 feet from those faults that are shown to be active or from fault traces where the risk cannot be determined.

Policy 1.8 Require review by a structural engineer when a critical building or facility undergoes substantial improvements.

Policy 1.9 Require site specific geotechnical analysis in areas of potential liquefaction, especially in and adjacent to the Chandler landfill.

Goal 2: Require that the City's Planning and Engineering Departments to review projects future development in the City.

Policy 2.1 Discourage development which is adjacent to earthquake faults and other geological hazards.

Policy 2.2 Prohibit residential development on non-engineered fill of any kind.

Policy 2.3 Develop stringent site design and maintenance standards for areas with high fire hazard or soil erosion potential.

Policy 2.4 Regularly review the technical data on public safety and seismic safety for use in the decision-making process.

Policy 2.5 Continue to require preliminary investigations of tract sites by State-registered geotechnical engineers and certified engineering geologists (Chapter 70 County

Building Code) and ensure regular inspection of grading operations. Code and Safety regulations.

Policy 2.6 Encourage residents to plant groundcover to reduce the brush fire hazard in areas adjacent to canyons, and to maintain native drought tolerant slope cover and provide appropriate irrigation to maintain plant cover and prevent erosion.

Policy 2.7 Maintain storm drains to prevent local flooding and debris flows, and encourage residents to assist in maintaining those drains that are the responsibility of the homeowner.

Policy 2.8 The City will continue to enforce the Water Conservation Ordinance adopted in 1991.

Policy 2.9 Avoid construction in canyon bottoms and participate in the National Flood Insurance Program. Require new development or expansion of existing development adjacent to canyons to assess potential environmental impacts from increased run-off and erosion and evaluate appropriate mitigation.

Policy 2.10 Continue to enforce a Class B Roofing Ordinance for new development but encourage residents with wood shingle/unrated roofing materials to retrofit or upgrade their roofs with resistant eaves and awnings.

Policy 2.11 Support the development of secondary water supplies for emergency water flow needs in an emergency.

Goal 3: Plan and provide for the occurrence of disasters and emergencies.

Policy 3.1 Develop and coordinate medical assistance procedures in the event of a major disaster.

Policy 3.2 Inventory and, where necessary, acquire supplemental disaster communication equipment and other equipment, tools, and supplies.

Policy 3.3 Ensure that adequate provisions are made to supply drinking water for extended periods of time in the event of a major disaster.

Policy 3.4 Develop procedures to follow in the event of flooding, erosion, and possible reservoir failure and investigate ways of reducing the likelihood of their occurrence.

Policy 3.5 Ensure that the City Hall maintains a current emergency supply of water, food, blankets, and first aid to provide for all employees for a 3 day period.

Policy 3.6 Encourage private businesses to develop disaster preparedness plans for their employees.

Policy 3.7 Support the development and further implementation of a peninsula-wide disaster plan.

Policy 3.8 Increase public awareness of City emergency response plans, evacuation routes and shelters, and in ways to reduce risks at the home and office.

Policy 3.9 Establish and maintain a Multi-hazard Functional Plan, mutual aid agreements with neighboring jurisdictions, and coordinate with the American Red Cross and Los

Angeles County Fire, Sheriff, and Public Social Services to develop specific plans for responding to emergencies.

Policy 3.10 Coordinate emergency planning efforts with building managers of high-occupancy facilities, dependent care centers (nursing homes, day care centers, etc.) and critical facilities located in the City to facilitate emergency response.

Goal 4: Assign key individuals In both the public and private sectors the responsibility of implementing public safety programs.

Policy 4.1 Provide City officials with a basis for disaster preparedness decision making and establish a public education program for disaster preparedness.

Policy 4.2 Establish a line of command to ensure that the decision making process will function satisfactorily in the event of a major disaster.

Policy 4.3 Coordinate with the citizen groups and organizations to establish a viable body to provide emergency assistance in the event of a natural disaster.

Policy 4.4 Encourage cooperation among adjacent communities to provide back-up law enforcement assistance in emergency situations.

Goal 5: Reduce local crime, to the greatest extent possible.

Policy 5.1 Work with, and support the Sheriff's Department in crime prevention and law enforcement efforts, to make sure there are adequate resources to meet the needs of the community.

Policy 5.2 Cooperate with neighboring cities, Los Angeles County, California State and U.S.

Policy 5.3 Evaluate the incidence of crime and develop measures needed to deter crime or apprehend the criminals.

Goal 6: Reduce the potential for hazardous waste contamination in the City.

Policy 6.1 Restrict the travel of vehicles carrying hazardous material through the City.

Policy 6.2 Monitor and limit the use and production of hazardous materials by businesses and industries in the City.

Policy 6.3 Ensure that no hazardous materials are dumped in Chandler Quarry landfill or in any other areas of the City.

Policy 6.4 Ensure that the Los Angeles County Sanitation District implements its closure and reclamation plans for Palos Verdes Landfill.

Policy 6.5 Support County Hazardous Materials Management Plan (adopted by C.C. Ordinance 516) objectives and enforcement of current Fire Code regulations regarding the storage of hazardous materials.

Policy 6.6 Work to promote the safe use and disposal of household hazardous wastes.

Mitigation Actions Matrix*†‡§

Following are Table 9-1 and 9-2: Mitigation Actions Matrix which identifies the existing and future mitigation activities developed by the Planning Team.

* **ELEMENT C: HAZARD IDENTIFICATION AND RISK ASSESSMENT | C1**
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))
† **ELEMENT C. MITIGATION STRATEGY | C4**
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))
‡ **ELEMENT D. MITIGATION STRATEGY | D2**
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))
§ **ELEMENT D. MITIGATION STRATEGY | D3**
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))

Table 9-1: Mitigation Actions Matrix: City of Rancho Palos Verdes

Action Item	Accomplishments (✓) and Ideas for Future Implementation (O)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
Multi-Hazard Action Items											
MH-1 Integrate the goals and action items from the Plan into existing regulatory documents and programs, where appropriate.	The Joint Hazard Mitigation Plan and its contents are discussed in the pending update of the Safety Element of the City's General Plan.	Hazard Mitigation Planning Subcommittee (HMS)	Ongoing	X	X	X	X	X	GF	M	Revised timeline. Added funding source and ranking
MH-2 Identify and pursue funding opportunities to develop and implement local mitigation activities.	✓ Successful California Water Resources Storm Water/Flood Management Grant; ✓ Tiger 4 Federal Grant (San Ramon Stabilization) ✓ FEMA HMGP	City Manager's Office	Ongoing	X	X	X	X	X	GR	H	Added accomplishments, funding source and ranking
MH-3 HMS will continue to develop a sustainable process for implementing, monitoring, and evaluating regional mitigation activities.	The HMS will meet semi-annually to monitor and evaluate regional mitigation activities.	HMS	Ongoing	X	X	X	X	X	GF	M	Added funding source and ranking

Action Item	Accomplishments (✓) and Ideas for Future Implementation (O)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
MH-4 Identify, improve, and sustain collaborative programs focusing on, public and private sector organizations, and individuals to avoid activity that increases risk to hazards.	Adopted local code amendments for enhanced building, geotechnical, and fire safety. Published related information that is available at the public counter, printed handouts, city newsletter, list-serve messages, and on the website. Provide partial fee waivers for seismic bolting/retrofit, replacement of wood shingles or shakes, and installing fire safe dual pane tempered glass windows. Standardized plans and checklists made available for the public. Presented information on cable TV, at local school, and during annual B&S Month	Community Development	Ongoing	X	X		X		GF	M	Added funding source and ranking
MH-5 Develop public and private	✓ Maintain cooperative outreach with	City Manager's Office, Public Works	Ongoing	X	X	X	X		GF	M	Revised action item, added funding source and

Action Item	Accomplishments (✓) and Ideas for Future Implementation (O)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
partnerships to foster hazard mitigation program coordination and collaboration with the City's HMS	PVPLC ✓ Integrate brush clearance support into waste hauler contract.										ranking
MH-6 Develop inventories of critical facilities and infrastructure.	✓ Assess deterioration, deficiencies, and vulnerability to the identified hazards and prioritize mitigation projects.	City Manager's Officer Public Works Building & Safety	Ongoing	X				X	GF	H	Revised action item, added ideas for implementation, funding source and ranking
MH-7 Strengthen emergency management program with maintained plans, training, and exercises.	Emergency Operations Plan has been updated and is at Cal OES for approval now. EOC Section training has been developed to train staff in their respective EOC positions. The City holds at least one annual emergency preparedness exercise activating the EOC at Level III and utilizing the majority of staff in EOC positions.	City Manager's Office	Ongoing	X	X	X	X	X	GF, GR	H	Added funding source and ranking
MH-8 Develop, enhance, and implement education	Enhanced building construction, geotechnical, and fire safety requirements	City Manager's Office, Community Development	Ongoing	X	X	X	X	X	GF	H	Added funding source and ranking

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
programs aimed at mitigating natural hazards, and reducing the risk to citizens, public agencies, private property owners, businesses, and schools.	Related information available at the public counter, on printed handouts, in city newsletter, and on the website. Partial fee waivers for certain building construction and energy saving upgrades. Standardized plans and checklists made available for the public.	LA County Fire Dept									
MH-9 Use updated technical knowledge and tools to inform the public of hazard potential.	Provide a separate public GIS web service that can be link from the City's website to show Hazard Maps	City Manager's Office, Planning, Public Works, GIS	Ongoing	X	X	X	X	X	GF, GR	M	Revised action item, coordinating organization, and accomplished goals. Added funding source and ranking
MH-10 Maintain hazard warning systems to ensure effectiveness and efficiency and increase coordination between local jurisdictions and emergency service	✓ Alert LA, Los Angeles County Regional Interoperability Community System ✓ Breaking News System ✓ Twitter Network	City Manager's Office	Ongoing	X	X	X	X	X	GF, GR	M	Revised coordinating organization and accomplished goals. Added ideas for implementation, funding source, and ranking

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
providers.											
MH-11 Update and Incorporate the Regional Evacuation Routes into appropriate planning documents.	✓ Updated General Plan Safety Element in 2010.	City Manager's Office Planning Department	Ongoing	X	X			X	GF	H	Added accomplishments, funding source and ranking
MH-12 Develop priorities for restoration of the community's infrastructure and vital public facilities following a disaster.	○ Establish restoration implementation procedures for vital facilities and establish decision making tools framework in the event of multiple site losses.	City Manager's Office, Public Works Community Development	5 years	X				X	GF, GR	M	Revised coordinating organization and timeline. Added funding source and ranking
MH-13 Develop policy for government to determine what reconstruction criteria should be applied to structures damaged during a disaster	○ Adopted chapter 34 and new State Existing Buildings Code ○ Develop additional zoning, building and reconstruction policies and requirements for post-disaster situations.	Community Development	Ongoing	X					GF, GR	M	Prepared Fire Ordinance. Revised action item and timeline. Added funding source and ranking
MH-14 Develop and implement programs to coordinate maintenance and	✓ Continue Landslide Road Maintenance Program. ✓ Continue Storm Drain	Public Works	Ongoing	X		X	X	X	GF, GR	H	Revised accomplished goals. Added funding source and ranking

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
mitigation activities to reduce risk to public infrastructure.	User Fee Maintenance and CIP program. ✓ Continue Pavement Management Program ✓ Continue Fuel Modification Program.										
MH-15 Place information on website and cable access channels to include information specific to residents, building code information, and educational information on damage prevention.	✓ Completed task now maintaining.	City Manager's Office, Community Development, & LA Co Fire Department	Ongoing	X	X			X	GF	H	Revised accomplished goals. Added accomplishments, funding source and ranking
~~MH-16 Establish policy to ensure mitigation projects are in place to safeguard critical facilities.~~		~~Public Works and Building and Safety Division~~	~~1-2 years~~	~~X~~				~~X~~	~~GF~~	~~H~~	Deleted (redundant)
MH-16 Incorporate the building inventory into the Mitigation Plan update.	✓ Completed during 2013 update to the Mitigation Plan. ✓ Future changes to the	Public Works and Building and Safety Division	Completed	X				X	GF	H	Revised accomplished goals. Added accomplishments.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
	building inventory will be incorporated into future updates to the Mitigation Plan.										
MH-17 Educate City staffs on federal cost-share & grant programs, and other related federal programs so the full array of assistance available is understood.	✓ Register appropriate staff for courses in the federal Public Assistance Reimbursement Process. ✓ Develop an internal process for tracking and preparing reimbursement requests following a disaster.	City Manager's Office Finance/IT	Ongoing	X			X	X	GF, GR	H	Revised coordinating organization. Added ideas for implementation, funding source, and ranking
~~MH-19 Determine the economic feasibility of mitigating natural hazards that can provide decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis~~		~~City Manager's Office~~	~~Ongoing~~	~~X~~							Deleted (redundant)

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
~~upon which to compare alternative projects.~~											
MH-18 Consider development of a Climate Action Plan.	✓ Completed through the South Bay Cities Council of Governments.	City Manager's Office	Completed	X		X	X		GF	H	Completed.
MH-19 Installation of an Emergency Communications Center (ECC) trailer and communications antenna on Rancho Palos Verdes City Hall Campus	✓ City staff worked with outside vendors and members of the Palos Verdes Alert Network to install project.	City Manager's Office	Completed	X		X	X	X	GF	H	New Action Item. Completed 2007.
MH-20 Implementation of Emergency Preparedness Committee "Beauty and the Beast" emergency preparedness presentation for community education.	✓ Initiated 2010-2011	City Manager's Office	Ongoing	X	X	X	X	X	GF	H	New Action Item. Completed 2011
MH-21 Emergency	Program initiated in the FY	City Manager's	2012-13	X	X	X	X	X	GF	H	New Action Item.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
Preparedness Committee emergency preparedness public service announcements program.	2010-11 Emergency Preparedness Committee Annual Work Plan and is being continued to their FY 2012-13 EPC Annual Work Plan.	Office									Completed 2013
MH-22 Implemented 3-day Emergency Personal Preparedness Kits City Council prize drawing program.	Program began in FY 2011-12 and may be continue through FY 2012-13 if approved by City Council.	City Manager's Office	Ongoing	X	X	X	X	X	GF	H	New Action Item.
MH-23 City Emergency Operations Plan updated and approved by City Council.	✓ Completed December 2010	City Manager's Office	2010	X	X	X	X	X	GF	H	New Action Item. Completed.
MH-24 City Emergency Operations Plan sent to Cal OES for approval.	As of 5-14-12, the plan is still at Cal OES for review.	City Manager's Office	2012	X	X	X	X	X	GF	H	New Action Item.
MH-25 Cal OES Grant approved for production of All-	Submitted application November 2010	City Manager's Office	2011-2012	X	X	X	X	X	GF, GR	H	New Action Item. Winning Grant.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (O)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
Hazard Multijurisdictional Mitigation Plan.											
MH-26 Conducted NIMS ICS 300 training for all City Emergency Operations Center section management staff.	✓ Provided training as referenced in the City's Emergency Operations Plan and to fulfill NIMS requirements.	City Manager's Office	2011	X	X	X	X	X	GF	H	New Action Item. Completed 2011.
MH-27 Implemented Disaster Service Volunteer Program.	✓ Implemented program and provided emergency identification badges for the City's Chief Operating Officers of Peninsula Volunteer Alert Network ham radio members.	City Manager's Office	2011-2012	X	X	X	X	X	GF	H	New Action Item. Completed 2012
MH-28 Provided Emergency Operations Center (EOC) Section training for all EOC Staff.	✓ City staff and emergency management consultant provided structure and criteria for EOC section training classes.	City Manager's Office	2011	X	X	X	X	X	GF	H	New Action Item. Completed 2011
MH-29 Conduct an	✓ At least one functional	City Manager's	Annually	X	X	X	X	X	GF	H	New Action Item.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (O)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
annual staff fully functional emergency preparedness exercise.	staff emergency preparedness exercise is held by the City each year as recommended by Cal OES and FEMA in order to received disaster reimbursement funds.	Office									
MH-30 Send emergency preparedness staff to workshops, seminars, and annual conferences for continual update of emergency management practices.	✓ City staff is sent to emergency preparedness training opportunities as often as possible.	City Manager's Office	Ongoing	X	X	X	X	X	GF	H	New Action Item.
MH-31 Implemented continuity of government emergency cache supply system.	✓ City staff and emergency preparedness consultant completed program and training of staff in 2011.	City Manager's Office	Ongoing	X	X	X	X	X	GF	H	New Action Item. Completed 2011
MH-32 Participate in LA County Department of Health	✓ City participates in program to assist with continuity of	City Manager's Office	Ongoing	X	X	X	X	X	GF	H	New Action Item.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (O)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
Services Antibiotics (Doxycycline) program.	government if staff and/or councilmember's are affected by a biological weapons attack.										
MH-33 Implementing American Red Cross (ARC) human shelter network.	○ City shelter facilities are inspected and approved by ARC. Memorandum of Understanding between City and ARC coming soon.	City's Manager's Office	2012	X	X	X	X	X	GF	H	New Action Item. Completed 2012
MH-34 Purchase Mobile EOC.	○ Explore possibility of purchasing a mobile EOC in case primary and secondary EOC's are rendered out of commission and/or another Peninsula City needs assistance.	City Manager's Office	5 years	X	X	X	X	X	GF, GR	H	New Action Item.
MH-35 Secure funding for a new City Hall campus with independent EOC.	○ The City needs a new City Hall Campus. The facility will not withstand a large scale earthquake or other type of disaster. The primary EOC is located within	City Manager's Office	5 years	X	X	X	X	X	GF, GR	H	New Action Item.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
	the building and also subject to collapse or severe damage.										
MH-36 Secure funding for utility vehicles and earthmoving equipment.	○ Front Loader, Haul Truck, 4-wheel drive vehicles, ATV's and/or "Gator" utility vehicles.	City Manager's Office, Public Works	1-3 years	X	X	X	X	X	GR	H	New Action Item.
MH-37 Secure funding for an emergency management consultant to provide Memorandum of Understanding's (MOU's) between city and vendors for food, water, temporary housing, and heavy equipment.	○ Cal OES and FEMA recommend cities be prepared by having MOU's in place first available service, protection from price gouging practices, and to simplify business transactions.	City Manager's Office	1-3 years	X	X	X	X	X	GR	H	New Action Item.
MH-38 Secure funding for consultant to provide future All Hazards Multi-Jurisdictional Mitigation Plan	○ City Hazard Mitigation Plans need to be updated every five years and a consultant with expertise in the subject matter is highly	City Manager's Office	5 years	X	X	X	X	X	GR	H	New Action Item.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (O)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
project assistance.	recommended.										
MH-39 Secure funding for a consultant to provide a Continuity of Operations Plan for the City.	○ Cal OES and FEMA recommend cities have a Continuity of Operations Plan. Fulfillment of this recommendation will enhance the City's chances of receiving future disaster reimbursement funds.	City Manager's Office	1-3 years	X	X	X	X	X	GF, GR	H	New Action Item.
MH-40 Secure funding for a consultant to secure funding and provide a children and family plan program and supplies to use during an emergency and/or disaster.	○ Staff may need to come in to work and bring children and/or family members they can't leave behind. A program like this would augment the City's response and recovery capabilities.	City Manager's Office	1-3 years	X	X	X	X	X	GR	H	New Action Item.
MH-41 Secure funding for HAZUS software.	Integrate HAZUS software into the City GIS System or obtain GIS data generated from HAZUS and upload those layers to City GIS System.	City Manager's Office	1-3 years	X	X	X	X	X	GR	H	New Action Item.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
MH-42 Secure funding to purchase existing City EOC equipment & peripherals (e.g. laptop computers, furniture, IT and telecommunications upgrades, etc.).	○ The City's EOC could use more equipment. More computers and telecommunication upgrades at the EOC Sections would assist staff with doing a more effective and efficient job.	City Manager's Office	1-3 years	X	X	X	X	X	GR	H	New Action Item.
MH-43 Secure funding to purchase protective Hazardous Materials equipment for staff to use in case of terrorist, sabotage, or WMD attacks.	○ Even though the odds are low that the City would be effected by a hazardous materials incident, it would not be a detriment to the City to have equipment on hand for disasters and/or emergencies just in case.	City Manager's Office	1-3 years	X	X	X	X	X	GR	L	New Action Item.
MH-44 Construction to stabilize San Ramon Canyon and roadways.	○ Divert runoff to minimize Tarapaca landslide movement, mudslides, and flooding on PVDS/25th Street.	Public Works	2 years	X		X			GF, GR	H	New Action Item.
MH-45 Emergency Generator Upgrades.	✓ Installation of emergency generators	Public Works	Completed					X	GF	H	New Action Item. Completed.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
	and propane fuel storage at City Hall (7-day supply), PVIC and Hesse Park (3-day fuel supply, each). ✓ Completed in 2011.										
MH-46 Hazardous Waste Roundup	✓ Hold free collection events for public drop off of hazardous waste. ✓ Annual	Public Works	Ongoing	X	X				GF	H	New Action Item.
MH-47 Brush and Landscape Materials Collection.	✓ Hold free collection events for public drop off of brush and vegetation waste. ✓ Twice annually	Public Works	Ongoing	X					GF	H	New Action Item.
MH-48 Heating System dedicated circuit at City Hall.	✓ Installed dedicated electrical circuit for space heaters to prevent overloading. ✓ Completed in 2010	Public Works	Completed	X					GF	H	New Action Item. Completed.
MH-49 Urban Forest Maintenance	✓ Continue regular trimming of urban street trees to safeguard utility lines and structures.	Public Works	Ongoing	X					GF	H	New Action Item.
MH-50 Revised City's Emergency Operations Plan	✓ Completed ✓ Update reflects current operations and	Finance/IT Department	Done	X	X	X	X	X	GL	H	New Action Item. Completed.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (O)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
Finance & Administration Section	increases the chance of receiving state and federal disaster reimbursement funds.										
MH-51 Revised City's Emergency Operations Plan to include an Incident Management / Messaging System.	✓ Completed ✓ The system assists staff and other agency members respond to disasters by locating and mapping incidents and providing an electronic messaging center inside the EOC.	Finance/IT Department	Done	X	X	X	X	X	GL	H	New Action Item. Completed.
MH-52 Update GIS system to assist staff and first responders with preparing, planning, response, and recovery operations.	✓ Completed manually mapped incidents reported during EOC drill to assist staff in decision making	Finance/IT Department	Ongoing	X	X	X	X	X	GL	H	New Action Item.
MH-53 Modified and expanded the role of the City Emergency Operations Center.	✓ Completed. ✓ Reconfigured the location of EOC Sections, installed additional white boards, new SMART boards, and satellite TV	City Manager's Office Finance/IT Department	2011	X	X	X	X	X	GL	H	New Action Item. Complete.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
	capabilities.										
MH-54 Maintain an off-site backup computer server.	✓ Backup server available in the event the main system is deemed inoperable.	Finance/IT Department	Completed	X	X	X	X	X	GL	H	New Action Item. Complete.
MH-55 Prepare a Vendor Memorandum of Understanding.	○ Finance to work with other city departments (e.g. PW and Community Development) to set up vendor Memorandum of Understandings to establish a partnership for first available service and to protect the City from price gouging practices.	Finance/IT Department Public Works Community Development	2014	X	X	X	X	X	*	M	New Action Item.
MH-56 Training on federal disaster reimbursement process.	○ Finance/IT Department or consultant to train Finance staff to learn the state and federal reimbursement process and how to fill out the forms.	Finance/IT Department	2013	X	X	X	X	X	GL, GF	H	New Action Item.
MH-57 Secure funding to purchase a 10' X 30' storage	○ Storage space is a premium at all City facilities. If additional	City Manager's Office Public Works	1-3 Years	X	X	X	X	X	GF, Grant	H	New action item.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
container to be placed on City Hall Campus grounds for various emergency/disaster response equipment and supplies.	emergency supplies and/or equipment is procured, there is an absolute need for more storage space.										
Earthquake Action Items											
EQ-1 Integrate new earthquake hazard mapping data and improve technical analysis of earthquake hazards using GIS technology.	○ Incorporated Fault Lines layer from USGS for EOC 2011; Integrate GIS files produced by HAZUS analysis into City GIS system for future implementation.	Finance/IT Department	Ongoing	X	X	X		X	GL, GF	H	New action item.
EQ-2 Identify funding sources for structural and nonstructural retrofitting of structures that are identified as seismically vulnerable for private property owners and businesses.	✓ Started in 2008 with fee reductions and retrofit standard plans for residential structures. Seek grant funding	HMS	Ongoing	X	X		X	X	GL, GF	H	Added funding source and ranking.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (O)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
EQ-3 Encourage seismic strength evaluations of critical facilities and public infrastructure in the City to meet current seismic standards.	✓ Started 2010: Completed for Administration, CDD and RPV TV buildings	Building and Safety Departments	5 years	X				X	GF	H	Added funding source and ranking.
EQ-4 Encourage reduction of nonstructural and structural earthquake hazards in homes, businesses, and government offices through public awareness.	✓ City Website ✓ Standard Plans ✓ Fee Discounts	City Manager's Office HMS	Ongoing	X	X				GF	H	Revised action item. Added accomplishments, funding source and ranking.
EQ-5 Hazard mitigation of seismic concerns, maintenance, and code related deficiencies at Ladera Linda	Building assessment conducted Feasibility Evaluation begun in 2011	Community Development Department, Public Works	Ongoing	X				X	*	H	New Action Item.
EQ-6 Participate in the OES SAP evaluator program.	✓ Building & Safety inspection staff members are now certified	Community Development	Completed	X			X	X	GF	H	New Action Item.
EQ-7 Ceiling Tile	✓ All three facilities	Public Works	Completed	X					GL	H	New Action Item.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (O)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
Seismic Retrofit in City Hall, PVIC and Hesse Park	completed in 2012.										Completed.
Wildfire Action Items											
WF-1 Encourage development and dissemination of information relating to the fire hazard to help educate and assist builders & homeowners in being engaged in wildfire mitigation activities, and to help guide emergency services during response.	Materials developed and being distributed on an ongoing basis.	City Manager's Office Los Angeles County Fire Department Building and Safety Division	Ongoing	X	X				GF	H	Revised timeline. Added funding source and ranking
WF-2 Increase communication, coordination & collaboration between wildland/urban interface property owners, local planners and fire prevention crews &	✓ City and LACFD work together to manage, communicate, coordinate, and mitigate wildland interface projects within City boundaries.	HMS	Ongoing	X	X	X	X	X	GL	H	Completed and ongoing action item.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (O)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
officials to address risks, existing mitigation measures, and federal assistance programs.											
WF-3 Encourage implementation of wildfire mitigation activities through enforcement in a manner consistent with the goals of promoting sustainable ecological management & community stability.	✓ LACFD and the City's Planning Department continue to implement wildfire mitigation activities through community education programs and written policy.	LACFD Planning Department	Ongoing			X			GF	H	Revised action item. Added funding source and ranking.
WF-4 Conduct Fire Expo.	✓ Conducted in 2009 by LA County Fire Department. Businesses attended and provided information on products for retrofitting homes to protect from wildfires (hardened homes)	LACFD	Completed	X	X	X	X	X	LACFD	H	New Action Item. Completed.
WF-5 Establish and	✓ Weed abatement	LACFD	Ongoing	X	X	X	X	X	GF	H	New Action Item.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (O)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
implement Weed Abatement Enforcement Program.	notices were mailed to residents annually with information as to what they need to comply with. ✓ Properties inspected annually.										
WF-6 Defensible home and fuel modification model project that shows building changes residents can implement.	✓ Shows landscape examples of what can be done to lower wildfire risk (defensible space).	LACFD – Forestry Division	Ongoing	X	X		X		LACFD	H	New Action Item.
WF-7 Burma Road Maintenance Agreement	✓ Partner with Edison, Cal Water, and LACFD to maintain Burma Road by preserving for emergency access. ✓ Expansion of fire roads. ✓ Annual	Public Works	Ongoing				X	X	GF	H	New Action Item.
WF-8 Fuel Modification Program	✓ Remove brush and debris within defensible space of development using LACC and goats. ✓ Annual maintenance program.	Public Works	Ongoing	X		X			GF	H	New Action Item.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
WF-9 GIS mapping of fuel modification defensible space areas.	✓ Completed ○ Add new or updated Fuel Modification areas to layer on City GIS system.	Public Works	Ongoing	X					GF, GR	H	New Action Item.
Landslide Action Items											
LS-1 Improve knowledge of landslide hazard areas and understanding of vulnerability and risk to life and property in hazard-prone areas.	✓ Established 3 landslide abatement districts. ✓ Published related information on website.	Planning and Building & Safety Divisions	Ongoing	X	X				GF	H	Added accomplishments, funding source and ranking.
LS-2 Address construction and subdivision design within steep slopes to reduce the potential adverse impacts from development.	✓ Public awareness of landslides area is provided daily. ✓ Geology/soils report required for review and approval by City Geologist prior to application completeness. ✓ Code prohibits most activity over extreme slope areas. ✓ Fire Department review	Planning and Building & Safety Divisions	Ongoing	X	X		X		GF	H	Revised accomplished goals. Added accomplishments, funding source and ranking.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (O)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
	required prior to new construction application completeness.										
LS-3 Regulate activities and provide public outreach in identified potential and historical landslide areas.	✓ Information regarding location of landslide areas are provided on City's website. All code/policy changes/ordinances are available online. ✓ Building & Safety regulates all activities after approval through Planning Department and City Geologist reviews.	Planning and Building & Safety Divisions	Ongoing	X	X	X			GF	H	Revised accomplished goals. Added accomplishments, funding source and ranking.
LS-4 Develop public information programs regarding proper maintenance of steep slopes and surface drainage structures located on private property.	✓ Vegetation management & flood control brochures made available.	Planning and Building Department	Ongoing	X	X				GF	H	Added funding source and ranking.
LS-5 PVDS Shoulder	✓ 1,200 foot shoulder	Public Works		X					GF,	H	New Action Item.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
Abutment	rebuild along south side of PVDS in landslide area to mitigate road movement. Completed 2010 ✓ Reestablish drainage through area, completed 2011. ✓ Ongoing Maintenance								GR		Completed.
LS-6 Install/maintain dewatering wells in landslide areas to mitigate land movement.	✓ Annually or as funds are available for these agencies.	Public Works, Abalone Cove Landslide Abatement District, Klondike Canyon Landslide Abatement District	Ongoing	X		X			*	H	New Action Item.
Tsunami Action Items											
TS-1 TsunamiReady	Pursue status as a TsunamiReady community through the National Weather Service.	HMS	1-2 years	X	X	X	X	X	GF	H	New
TS-2 Increase Tsunami awareness.	Add Tsunami awareness information to City's website. Add link to State of California's Tsunami Awareness resources.	HMS	1-2 years	X	X	X	X	X	GF	H	New

Action Item	Accomplishments (✓) and Ideas for Future Implementation (O)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
Flood Action Items											
FL-1 Continue to participate in the National Flood Insurance Program.	Continue through the development review process and issuance of building permits.	Planning, Building & Safety	Ongoing	X	X	X	X	X	GF	H	New

Table 9-2: Mitigation Actions Matrix: City of Rolling Hills Estates

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
Multi-Hazard Action Items											
MH-1 Integrate the goals and action items from the Joint Natural Hazards Mitigation Plan into existing regulatory documents and programs, where appropriate.	○ Safety Element Update	Hazard Mitigation Planning Subcommittee (HMS)	Ongoing	X	X	X	X	X	GF, GR	H	Revised timeline. Added funding source and ranking
MH-2 Identify and pursue funding opportunities to develop and implement local mitigation activities.	✓ FEMA HMGP	City Manager's Office	Ongoing	X	X	X	X	X	GR	H	Added ideas for implementation, funding source and ranking
MH-3 Hazard Mitigation Planning Subcommittee will continue to develop a	○ Meet twice a year	HMS	Ongoing				X		GF	M	Added funding source and ranking

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
sustainable process for implementing, monitoring, and evaluating regional mitigation activities.											
MH-4 Identify, improve, and sustain collaborative programs focusing on, public and private sector organizations, and individuals to avoid activity that increases risk to natural hazards.	○ Safety Element Update	Planning, City Manager's Office	Ongoing	X	X		X		GF, GR	H	Added funding source and ranking
MH-5 Develop public and private partnerships to foster natural hazard mitigation program coordination and collaboration with	○ Continue Waste Management disposal of brush clearance material and curb side pickup of hazardous waste	City Manager's Office	Ongoing	X	X		X		GF	M	Revised action item, added funding source and ranking

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
the City's Hazard Mitigation Subcommittee.											
MH-6 Develop inventories of critical facilities and infrastructure.	✓ Assess structural vulnerability to the identified hazards and prioritize mitigation projects.	Public Works, Building & Safety, City Manager's Office	Ongoing	X				X	X	X	Revised action item, added ideas for implementation, funding source and ranking
MH-7 Strengthen emergency management program with maintained plans, training, and exercises.	○ Completion and ongoing review of our Continuity and Operations Plan	City Manager's Office	Ongoing					X	GF, GR	H	Added funding source and ranking
MH-8 Develop, enhance, and implement education programs aimed at mitigating natural hazards, and reducing the risk to citizens, public agencies, private property owners, businesses, and	✓ "Nextdoor" is a social network that enables neighbors to communicate with each other and allows the City to post important information during times of emergency.	City Manager's Office	Ongoing	X	X	X	X	X	GF, GR	H	Added funding source and ranking

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
schools.											
MH-9 Use updated technical knowledge and tools to inform the public of hazard potential.	○ Safety Element Update, website, City newsletter	Planning, Public Works	Ongoing	X	X	X	X	X	GF, GR	H	Revised action item, and accomplished goals. Added funding source and ranking
MH-10 Maintain hazard warning systems to ensure effectiveness and efficiency and increase coordination between local jurisdictions and emergency service providers.	✓ Alert LA (Sheriff's Dept) ○ Los Angeles County Regional Interoperability Community System	City Manager's Office	Ongoing	X				X	GF, GR	M	Revised coordinating organization. Added ideas for implementation, funding source, and ranking
MH-11 Update and Incorporate the Regional Evacuation Routes into appropriate planning documents.	○ Seek funding to update the General Plan Safety Element and other Elements.	City Manager's Office, Planning	Ongoing	X				X	GR	H	Added ideas for implementation, funding source and ranking

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
MH-12 Develop priorities for restoration of the community's infrastructure and vital public facilities following a disaster.	✓ Completed through Continuity of Operations Plan	Public Works, Planning		X							
MH-13 Adopt and implement State Building Code Chapter 34.	○ Develop policy for government to determine what reconstruction criteria should be applied to structures damaged during a disaster. Develop additional zoning, building and reconstruction policies and requirements in the local government development and building codes for post-disaster situations (Post-Disaster Recovery Plan).	Building & Safety, Community Development	5 years	X					GR	L	
MH-14 Develop and implement	○ Safety Element Update	Public Works, Building & Safety	Ongoing	X		X	X	X	GR	H	Revised accomplished goals. Added funding

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure.											source and ranking
MH-15 Maintain information on website and cable access channels to include information specific to residents, building code information, and educational information on damage prevention.	✓ Completed task; now maintaining.	City Manager's Office, Planning, Building & Safety	Ongoing	X	X				GF	H	Revised Action Item, accomplished goals. Added accomplishments, funding source and ranking
~~MH-16 Establish policy to ensure mitigation projects are in place to safeguard critical facilities.~~		~~Public Works and Building & Safety Division~~	~~1-2 years~~	~~X~~				~~X~~			Deleted (redundant)
MH-16 Incorporate	✓ Completed 2012.	Public Works, Building	Ongoing	X				X	GF	H	Revised accomplished

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
the building inventory into the Mitigation Plan update.	○ Incorporate future building inventory revisions into future updates of the Mitigation Plan.	& Safety									goals. Added accomplishments and ideas for implementation.
MH-17 Educate City staff on federal cost-share & grant programs, and other related federal programs so the full array of assistance available is understood.	✓ eCivis grant program acquired to monitor available funding.	City Manager's Office	Ongoing				X		GF, GR	M	Revised coordinating organization. Added funding source, and ranking
~~MH-19 Determine the economic feasibility of mitigating natural hazards that can provide decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis~~		~~City Manager's Office~~	~~Ongoing~~	~~X~~							Deleted (redundant)

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
~~upon which to compare alternative projects.~~											
MH-18 Consider development of a Climate Action Plan.	○ To be completed through the South Bay Cities Council of Governments.	City Manager's Office		X							1 Year.
~~MH-21 Prepare a cost analysis of replacing vulnerable public infrastructure, buildings and critical facilities~~		~~Planning and Building Safety Department~~	~~Ongoing~~	~~X~~				~~X~~			Deleted (redundant)
MH-19 Prepare and update the Continuity of Operations Plan.	✓ Continuity of Operations Plan completed in 2010 ✓ Update every 5 years	City Manager's Office	Ongoing	X				X	GF	H	New Action Item.
MH-20 Provide updated mobile communication devices for key personnel.	○ Research and purchase updated equipment	City Manager's Office	1 year	X				X	GF	H	New Action Item.
MH-21 Solicit grant funds for an area-wide pre-	○ Request for local funding submitted; Safety Element	City Manager's Office	3 years	X				X	GR	H	New Action Item.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
positioned Emergency Supplies and Equipment Cache.	○ Update to address appropriate placement of supplies										
MH-22 Coordinate with the Los Angeles County Sanitation Districts to ensure that an appropriate mitigation action plan and disaster response plan is in place for the Palos Verdes Landfill.	○ Safety Element Update	City Manager's Office	2 years	X			X		GR	H	New Action Item.
Earthquake Action Items											
EQ-1 Integrate new earthquake hazard mapping data and improve technical analysis of earthquake hazards using GIS technology.	○ Information to be generated through Safety Element Update and incorporated into City GIS	Finance and IT Department, Planning	Ongoing	X				X	GF, GR	M	Added funding source and ranking
EQ-2 Encourage seismic strength evaluations of	✓ Completed evaluation in 2006.	Building & Safety		X				X			Completed.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
critical facilities and public infrastructure in the City to meet current seismic standards.											
EQ-3 Encourage reduction of nonstructural and structural earthquake hazards in homes, businesses, and government offices through public awareness.	✓ City Website	HMS, City Manager's Office	Ongoing	X	X				GF	H	Revised action item. Added accomplishments, funding source and ranking.
Wildfire Action Items											
WF-1 Encourage development and dissemination of information relating to the fire hazard to help educate and assist builders & homeowners in being engaged in	✓ Materials developed and being distributed on an ongoing basis and posted on City website.	LA County Fire Department, Building & Safety, City Manager's Office	Comple-ted and Ongoing	X					GF	H	Revised timeline. Added accomplishments, funding source and ranking

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
wildfire mitigation activities, and to help guide emergency services during response.											
WF-2 Continue communication, coordination & collaboration between wildland/urban interface property owners, local planners and fire prevention crews & officials to address risks, existing mitigation measures, and federal assistance programs.	○ Annual brush clearance coordinated by LA County Fire Department	HMS, LA County Fire Department	Ongoing	X	X		X	X	GF	H	Added funding source and ranking
WF-3 Encourage implementation of wildfire mitigation activities through enforcement in a	○ Plan Check for fire code compliance, and Planning Department Code Enforcement and Fire Department	LA County Fire Department and Planning Department	Ongoing			X			GF	H	Revised action item. Added funding source and ranking.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
manner consistent with the goals of promoting sustainable ecological management & community stability.	inspections.										
WF-4 Conduct Fire Expo.	✓ Conducted in 2009 by LA County Fire Department. Businesses attended and provided information on products for retrofitting homes to protect from wildfires (hardened homes)	LA County Fire Department		X	X	X	X	X			New Action Item. Completed.
WF-5 Establish and implement Weed Abatement Enforcement Program.	✓ Weed abatement notices were mailed to residents annually with information. ✓ Properties inspected annually.	LA County Fire Department	Ongoing	X	X	X	X	X	GF	H	New Action Item.
WF-6 Defensible home and fuel modification model project that shows	✓ Shows landscape examples of what can be done to lower wildfire risk (defensible	Los Angeles County Fire Department – Forestry Division	Ongoing	X	X		X		GF	M	New Action Item.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
building changes residents can implement.	space) on City website.										
Landslide Action Items											
LS-1 Improve knowledge of landslide hazard areas and understanding of vulnerability and risk to life and property in hazard-prone areas.	○ Safety Element Update	Planning, Building & Safety	Ongoing	X	X				GR	H	Added funding source and ranking.
LS-2 Address construction and subdivision design within steep slopes to reduce the potential adverse impacts from development.	○ Safety Element Update	Planning, Building & Safety	Ongoing	X			X		GR	H	Added accomplishments, funding source and ranking.
LS-3 Regulate activities and provide public outreach in identified potential	○ Safety Element Update	Planning, Building & Safety	Ongoing	X	X				GR	H	Added funding source and ranking.

Action Item	Accomplishments (✓) and Ideas for Future Implementation (○)	Coordinating Organization	Timeline	Plan Goals Addressed					Funding Source (* = not yet identified, GF = General Fund, GR = Grants)	Ranking (L=Low, M=Med, H=High, n/a=not applicable)	2013 Comments (Status – Completed, Revised, Deleted, New, and Deferred)
				Protect Life and Property	Public Awareness	Natural Systems	Partnerships and Implementation	Emergency Services			
and historical landslide areas.											
LS-4 Develop public information programs regarding proper maintenance of steep slopes and surface drainage structures located on private property.	○ Safety Element Update	Planning, Building & Safety	Ongoing	X	X				GR	H	Added funding source and ranking.
Flood Action Items											
FL-1 Continue to participate in the National Flood Insurance Program	Continue through the development review process and issuance of building permits.	Planning, Building & Safety	Ongoing	X	X	X	X	X	GF	H	New

Section 10: Planning Process

Plan Methodology

DMA 2000 emphasizes the importance of participatory planning in the development of Mitigation Plans. This Plan was written using the best available information from a wide variety of sources.

Throughout the planning process, the Cities made a concerted effort to gather information from City and County departments, as well as state and federal agencies, the local business community, planning area residents, and other stakeholders.

Disaster Mitigation Act of 2000

Requirement §201.6(c) (1)

[The plan shall include…:] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

The Planning Team solicited information from internal and external departments and agencies with specific knowledge of hazards and past historical events, as well as planning and zoning codes, ordinances, and recent planning decisions. The hazard mitigation strategies contained in this plan were developed through an extensive planning process involving local businesses and residents.

In advance of presentation to the City Councils, the Planning Team submitted the Draft Plan to Cal OES and FEMA for review and conditional approval. FEMA conditional approval was granted on June 13, 2013, pending minor revisions and adoption by both City Councils.

Prior to presentation to the City Councils, the 2013 Plan was made available for review by external reviewers and the general public. Input gathered from the review was incorporated into the Plan and included in the staff reports to the City Councils. On December 3, 2013, staff presented the Plan to the City of Rancho Palos Verdes City Council for discussion and adoption. On _____, staff presented the Plan to the City of Rolling Hills Estates City Council for discussion and adoption. Copies of the City Council Resolutions adopting the Plan appear in Section 10: Planning Process. Following adoption by both City Councils, the Plan was re-submitted to FEMA. On _____ FEMA issued a final approval on the 2013 Plan.

The rest of this section describes the mitigation planning process including: 1) stakeholder involvement, 2) extended Planning Team support, 3) public and other stakeholder involvement; and 4) integration of existing data and plans.

Stakeholder Involvement

The stakeholders in this project included the Planning Team which consisted of internal and external department representatives from both Cities and external agencies. All contributed greatly to the planning process during Planning Team meetings and the review process. The stakeholder contributions included identifying hazard events, provision of status updates to the Mitigation Actions Matrix, development of new mitigation action items, developing public input strategies, and participating in plan review. Also, the stakeholders provided numerous City-

specific documents including the Capital Improvement Plans, General Plans, and other data sources critical to the planning process.

Planning Team

The Planning Team first met on January 12, 2012 to review the updated requirements associated with DMA 2000 and to develop a work plan for creating the 2013 Plan. Additional Planning Team meetings were held on February 9, 2012, March 8, 2012, March 29, and April 19, 2012. The early meetings focused on identifying hazards and vulnerabilities, while the later meetings were dedicated to capturing the status of 2004 mitigation actions and development of new action items.

Who Participated in Developing the Plan?

The Plan is the result of a collaborative planning effort between Cities of RPV/RHE citizens, public agencies, non-profit organizations, the private sector, regional, and state and federal organizations. Public participation played a key role in development of goals and action items. A Planning Team guided the process of developing the plan and consisted of representatives identified in Table 10-2.

Table 10-1: Planning Team Timeline

	January 2012	February	March	April	May	June	July	August	September	October	November	December	January 2013	February	March
Issue Request for Proposal	X														
Contracted with Emergency Planning Consultants (EPC)	X														
Research and Writing of 2013 Plan	X														
Planning Team Meetings	X	X	X	X											
Review and Comment on Draft Plan					X	X	X	X	X	X					
Prepare Final Draft											X				
Cal OES and FEMA Review												X	X	X	
Present 2013 Plan to City Councils at Public Meetings															X

Table 10-2: Planning Team Level of Participation*

	Issue Request for Proposal	Contract with Emergency Planning Consultants	Research and Writing of 2013 Plan	Attend Planning Team Meetings	Review and Comment on Draft Plan	Prepare Final Draft	Cal OES/FEMA Review	Participate in RPV Emergency Planning Committee Meeting	Attend City Council Public Meeting
Tracy Bonano, RPV Point of Contact	X	X	X	X	X		X	X	X
So Kim			X	X	X				
Paul Christman			X	X	X				
Kathryn Downs			X	X	X				
Dennis McLean			X	X	X				
Lina Nguyen			X	X	X				
Andy Bradford			X	X	X				
Andy Winje			X	X	X				
Greg Grammer, RHE Point of Contact	X	X	X	X	X				X
Niki Wetzel			X	X	X				X
Laura Walters			X	X	X				
Jeffrey Robinson			X	X	X				
Carolyn Harshman, Emergency Planning Consultants		X	X	X		X	X		X

*** ELEMENT A: PLANNING PROCESS | A1**

A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))

Planning Team Involvement

The Planning Team was responsible for the following tasks:

- ✓ Establish plan development goals
- ✓ Prepare timetable for plan completion
- ✓ Ensure plan meets DMA 2000 requirements, and federal and state guidelines
- ✓ Organize and oversee public involvement
- ✓ Solicit participation of government agencies, businesses, residents, and other stakeholders
- ✓ Gather information (such as existing data and reports)
- ✓ Develop, revise, adopt, and maintain plan
- ✓ Participate in Planning Team meetings and City County public meeting

The Planning Team, with support from other City staff and local organizations, identified and profiled hazards; determined hazard rankings; estimated potential exposure or losses; evaluated development trends and specific risks; and developed mitigation goals, objectives, and activities.

During its meetings the Planning Team gathered and shared information, assessed risks, identified critical facilities, developed mitigation strategies, and provided continuity throughout plan development to ensure the plan addresses jurisdiction-specific hazard vulnerabilities and mitigation strategies. Members communicated regularly by phone and email between group meetings.

Both Cities will create a Hazard Mitigation Planning Team Subcommittees following FEMA approval of the 2013 Plan. Both Subcommittees will meet semi-annually after the plan is adopted. Members of the Subcommittees will provide project direction and oversight, assist with plan evaluation, and convene supplementary meetings as-needed.

Outside Agency Involvement*

In additional to the outside agencies involved on the Planning Team – Los Angeles County Fire Department and Area G – other outside agencies were informed of the availability of the Final Draft Plan and encouraged to provide input. Once the Plan was received back from FEMA with a conditional approval, the availability of the Plan will be announced by sending electronic notification to agency leaders. Any comments received through the external review process will be identified in the staff reports to the City Councils and will be incorporated into the Final Plan. The list of neighboring communities, local and regional agencies that will be invited to review the Final Draft Plan are listed below:

- City of Rolling Hills
- City of Palos Verdes Estates

*** ELEMENT A: PLANNING PROCESS | A2**

A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))

- Palos Verdes Peninsula Unified School District
- Los Angeles County Sheriff
- Verizon California
- Southern CA Edison
- The Gas Company
- Cal Water
- Palos Verdes Peninsula Chamber of Commerce

State and Federal Guidelines and Requirements for Mitigation Plans

Following are the Federal requirements for approval of a mitigation plan:

- ✓ Open public involvement, with public meetings that introduce the process and project requirements.
- ✓ The public must be afforded opportunities for involvement in identifying and assessing risk, drafting a plan, and public involvement in approval stages of the plan.
- ✓ Community cooperation with an opportunity for other local government agencies, the business community, educational institutions, and non-profits to participate in the process.
- ✓ Incorporation of local documentation including the local General Plan, the Zoning Ordinance, the Building Codes, and other pertinent documents.

The following components must be part of the planning process:

- ✓ Complete documentation of the planning process
- ✓ A detailed risk assessment on hazard exposures in the planning area
- ✓ A comprehensive mitigation strategy, which describes the goals and objectives, including proposed strategies, programs and actions to avoid long-term vulnerabilities
- ✓ A plan maintenance process, which describes the method and schedule of monitoring, evaluating and updating the plan and integration of the Plan into other planning mechanisms
- ✓ Formal adoption by the City Councils
- ✓ Plan review by Cal OES
- ✓ Plan approval by FEMA

These requirements are identified in greater detail in the following plan sections and supporting documentation.

Through its consultant, Emergency Planning Consultants, the Cities had access to numerous existing mitigation plans from around the country, as well as current FEMA Mitigation Planning standards (386 series) and the State of California Mitigation Plan Guidance.
Other reference materials consisted of state, county, and city mitigation plans, including:

- ✓ County of Los Angeles Mitigation Plan (Draft 2013)
- ✓ State of California Multi-Hazard Mitigation Plan (2010)

To facilitate communication between the Planning Team and RPV/RHE residents, and to involve the public in ongoing planning and evaluation, this plan will be available to the public through a variety of venues.

Hazard specific research: City staffs collected data and compiled research on five hazards: earthquakes, wildfires, earth movement, tsunamis, and technological/human-caused hazards.

Research materials came from the Cities' General Plans, the Cities' Hazard Analysis contained in the Emergency Operations Plan, and state agencies including Cal OES and CAL FIRE. The City staffs conducted research by referencing long time City employees and locating information in historical documents. Information was also incorporated from after-action documentation provided for previous proclaimed and declared disasters. The City staffs also played a critical role in capturing previously unidentified mitigation activities, current and new mitigation activities, hazard resources, and ongoing programs.

Public Participation*

During the review period prior to submission of the Plan to the City Councils, public participation opportunities were created through use of a two week public comment period using hard copy and electronic media output transmitted through various city publicity outlets and conventional public noticing techniques utilized by both Cities. In addition, the makeup of a Planning Team ensured a constant exchange of data and input from outside organizations. Copies of the notices of availability can be found at the end of the Planning Process Section. (Note: these will be inserted following the public review process, prior to the City Council hearings.)

To facilitate communication between the Planning Team and RPV/RHE residents, and to involve the public in ongoing planning and evaluation, the adopted Final Plan will be available to the public through a variety of venues, including posting on both City websites. Community involvement increases the likelihood that hazard mitigation will become a standard consideration in the planning area.

Hazard Mitigation Programs

The Cities of RPV/RHE adheres to the Stafford Act, the California Emergency Services Act, and DMA 2000, which require local governments to develop and implement mitigation plans. Cities and counties have intimate knowledge of local geography, and they are on the front line with personnel and equipment during a disaster. Local governments are in the best position to assess their strengths, weaknesses, opportunities, and constraints.

* ELEMENT A: PLANNING PROCESS | A3
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))

Coordination with Federal Policies*

The Cities are involved in the NFIP, which helps the planning area receive funding for flood insurance and flood mitigation projects. Data from the NFIP was used in the risk assessment, resulting in a number of mitigation activities. According to the NFIP Community Status Report, both RPV/RHE are classified as Zone C Flood Areas, meaning there are no special flood hazard areas within either of the City limits. FEMA defines Zone C as a low-risk area above the 500-year flood level. This means that there is a 0.2% chance that an annual flood will occur.

National Flood Insurance Program

Established in 1968, the NFIP provides federally-backed flood insurance to homeowners, renters, and businesses in communities that adopt and enforce floodplain management ordinances to reduce future flood damage. In both Cities, the Planning Director is designated as floodplain administrator.

Current Mitigation Programs

The Cities intend to incorporate mitigation planning as an integral component of daily operations; the Hazard Mitigation Planning Subcommittee will work to integrate mitigation strategies into the general operations of the Cities and partner organizations. After conducting a risk assessment (Section 3: Risk Assessment), the Subcommittees will identify additional policies, programs, practices, and procedures that could be modified to address mitigation activities. In addition, the Cities intend to implement the plan through its involvement in FEMA and Cal OES programs. Table 10-3: Existing Processes and Programs identify existing opportunities through which the Plan can be implemented.

Table 10-3: Existing Processes and Programs

Process	Action	*Implementation of Plan*
Administrative	Departmental or organizational work plans, policies, and procedural changes	✓ *City Manager's Office* ✓ *Planning Department* ✓ *Public Works Department* ✓ *Other departments as appropriate*
Administrative	Other plans	✓ *Reference plan in Emergency Operations Plan* ✓ *Address plan findings and incorporate mitigation activities in General Plan*
Budgetary	Capital and operational budgets	✓ *Include line item mitigation measures in budget as appropriate*

* **ELEMENT C. MITIGATION STRATEGY | C2**

C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))

Table 10-3: Existing Processes and Programs

Process	Action	*Implementation of Plan*
Regulatory	Executive orders, ordinances, and other directives	✓ *Building Code* ✓ *Capital Improvement Plan (Require hazard mitigation in design of new construction)* ✓ *Comprehensive Planning (Institutionalize hazard mitigation in land use and new construction)* ✓ *National Flood Insurance Program* ✓ *Storm Water Management Plan* ✓ *Zoning Ordinance*
Funding	Traditional and nontraditional sources	✓ *Once plan is approved, seek authority to use bonds, fees, loans, and taxes to finance projects* ✓ *Seek assistance from federal and state government, foundation, nonprofit, and private sources, such as Hazard Mitigation Grant Program* ✓ *Research grant opportunities through U.S. Department of Housing and Urban Development, Community Development Block Grant*
Partnerships	Creative funding and initiatives	✓ *Community volunteers* ✓ *In-kind resources* ✓ *Public-private partnerships* ✓ *State support*
Partnerships	Advisory bodies and committees	✓ *Disaster Council* ✓ *Emergency Preparedness Committee* ✓ *Inter-Agency Coordination Group*

In addition to being required by DMA 2000, adoption of the plan is necessary because:

It lends authority to the plan to serve as a guiding document for all local and state government officials;

It gives legal status to the plan in the event it is challenged in court;

It certifies to program and grant administrators that the plan's recommendations have been properly considered and approved by the governing authority and jurisdictions' citizens; and

It helps to ensure the continuity of mitigation programs and policies over time because elected officials, staff, and other community decision-makers can refer to the official document when making decisions about the community's future.

Source: FEMA. 2003. "How to Series" - *Bringing the Plan to Life* (FEMA 386-4)

Use of Existing Data

The Planning Team gathered and reviewed existing data and plans during plan development. Numerous electronic and hard copy documents were used to support the planning process:

- ✓ City of Rancho Palos Verdes General Plan
- ✓ City of Rolling Hills Estates General Plan
- ✓ County of Los Angeles General Plan, (Draft 2013)
- ✓ County of Los Angeles All-Hazards Mitigation Plan, (Draft 2013)
- ✓ HAZUS maps reports (included in this update to the Hazard Mitigation Plan)
- ✓ Historic GIS maps and local inventory data

These documents are updated as needed to reflect the mitigation strategies identified in Section 9: Mitigation Strategies.

Federal Data

A variety of federal data was collected and used throughout the mitigation planning process:

- ✓ Census data
- ✓ FEMA "How To" Mitigation Series (386-1 to 386-9)
- ✓ National Oceanic and Atmospheric Administration Statistics

The Planning Team also examined public laws and programs (such as the National Flood Insurance Program) during plan development.

A list of existing data and plans used to support the mitigation planning effort appears in Appendix A: Resource Directory. The length of this list demonstrates the importance of mitigation planning in existing programs. Implementing the plan through existing programs is identified as a mitigation action in Section 9: Mitigation Strategies. A description of the implementation process and potential funding sources is provided.

Plan Adoption

The Planning Team chose to send the 2013 Plan first to Cal OES and FEMA for a joint review and conditional approval prior to distributing the Plan for external review and presentation to the City Councils for adoption.

Adoption of the plan by the City Council demonstrates the Cities' commitment to meeting mitigation goals and objectives. A governing body's adoption legitimizes the plan and authorizes responsible entities within the City to execute their responsibilities. The resolution of adoption by each City Council is located in Section 10: Planning Process.

Public Meetings

The City of Rancho Palos Verdes and the City of Rolling Hills Estates conducted a public review period and incorporated any gathered comments prior submission of the Final Plan to the City Councils. In both cases, the Planning Team representatives prepared a staff report outlining the planning process and presented the Plan during the following public meetings:

City of Rancho Palos Verdes
On June 21, 2012, the City's Emergency Planning Committee was briefed on the Plan and informed they would be provided access to the Final Plan and that their input would be welcomed. On _____, the Rancho Palos Verdes City Council heard the item and voted _____ to adopt the Plan.

City of Rolling Hills Estates
On _____, the Rolling Hills Estates City Council heard the item and voted _____ to adopt the Plan.

Invitation Process

The Planning Team identified possible public notice sources. On _____, the Agenda Item concerning this Plan was posted on the City websites. In addition, it was posted at both City Halls and each of the City Libraries.

Attachment 10-1: City Council Resolutions

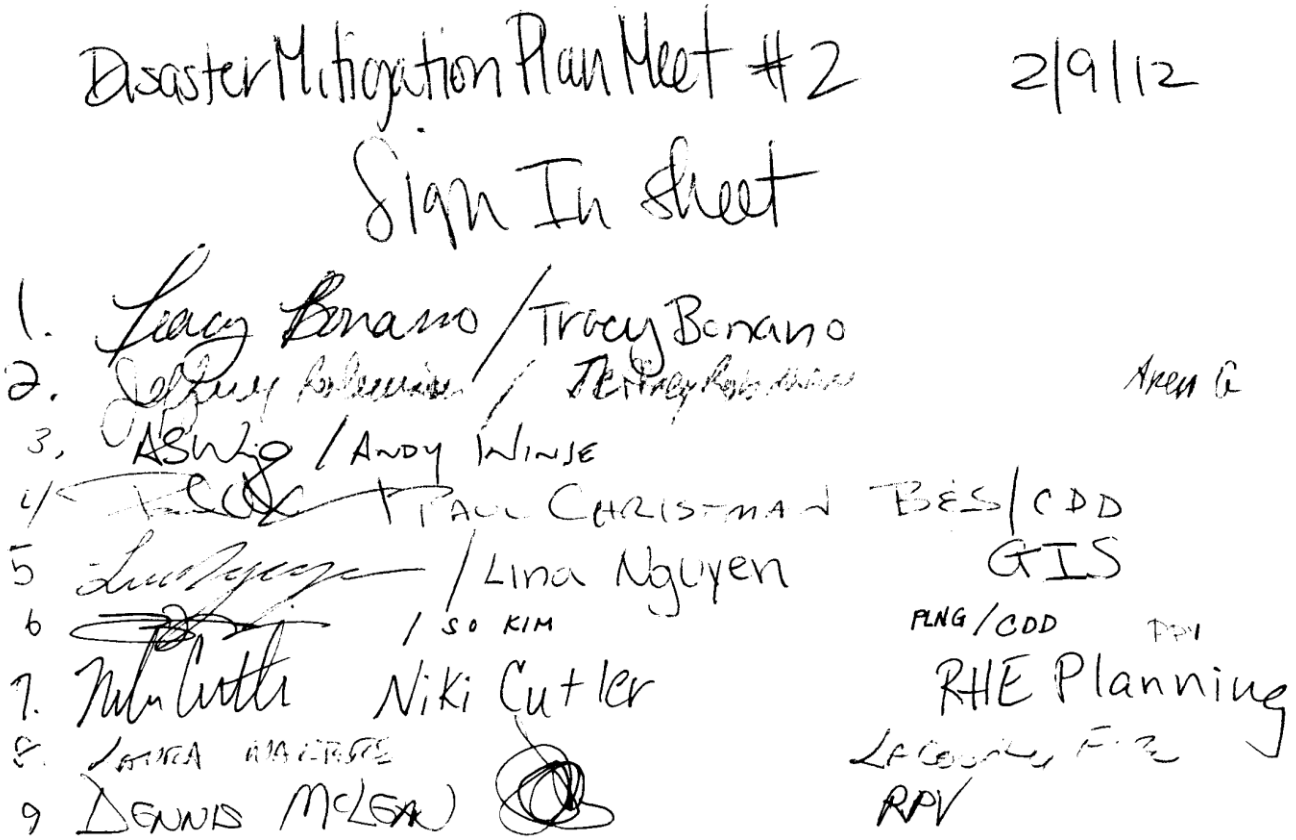
Attachment 10-2: Planning Team Sign-In Sheet: January 12, 2012

Multi-Jurisdictional Hazard Mitigation Plan
Planning Team Workshop #1
January 12, 2012

City	Name	Department
RPV - PVNET	Lina [illegible]	GIS
LA County Fire	Laura Walters	
RPV	So Kim	Community Dev. Dept.
RPV	Kathryn Downs	Finance & IT
RPV	Paul Christman	CDD
RPV	Andy Winje	PW
Area G	Jeffrey Robinson	DMAC
RHE	Niki Cutler	Planning
RHE	Greg Grammer	Asst. City Manager / Public Works
RPV	Tracy Bonano	CM/REP

Emergency Planning Consultants

Attachment 10-3: Planning Team Sign-In Sheet: February 9, 2012



Disaster Mitigation Plan Meet #2 2/9/12

Sign In Sheet

1. Tracy Bonano / Tracy Bonano
2. [illegible] / [illegible] Area G
3. ASHLEY / ANDY WINSE
4. [illegible] PAUL CHRISTMAN BES/CDD
5. [illegible] / Lina Nguyen GIS
6. [illegible] / SO KIM PLNG/CDD PPI
7. [illegible] Niki Cutler RHE Planning
8. [illegible] [illegible]
9. DENNIS McLEAN RPV

Attachment 10-4: Planning Team Sign-In Sheet: March 8, 2012

Multi-Jurisdictional Hazard Mitigation Plan
Cities of Rancho Palos Verdes and Rolling Hills Estates
Planning Team Meeting #3
March 8, 2012

Name	Department
[illegible]	[illegible]
SO KIM	CDD
Jeff Robinson	Area G
Tracy Bonano	City Manager's Office
Andy Winje	Public Works
PAUL CHRISTMAN	RPV Bldg & Safety
Greg Grammer	RHE Public Works/City Manager's office
Riki Cutler	RHE Planning
Andy Bradford	PVNET GIS
LAURA WALTERS	LA County Fire

Emergency Planning Consultants

Attachment 10-5: Planning Team Sign-In Sheet: March 29, 2012

Multi-Jurisdictional Hazard Mitigation Plan
Cities of Rancho Palos Verdes and Rolling Hills Estates
Planning Team Meeting ~~#3~~ #4
~~March 8, 2012~~ MARCH 29, 2012

Name	Department
CAROLYN HARSHMAN	EMERGENCY PLANNING CONSULTANTS
JO KIM	RPV PING.
Andy Bradford	PVNET GIS Dept.
Andy Winje	RPV PW
Lina Nguyen	PVNet GIS Dept.
Jeffrey Robinson	Area B
Tracy Bonanno	City Managers Office / Rec. + Parks
Greg Grammer	Asst. City Manager
LAURA WALTERS	L.A. County Fire

Emergency Planning Consultants

Attachment 10-6: Planning Team Sign-In Sheet: April 19, 2012

Cities of Rancho Palos Verdes and Rolling Hills Estates
Hazard Mitigation Planning Team Meeting
April 19, 2012

Name	Department
Carolyn Harshman	Emergency Planning Consultants
Greg Grammer	Asst. City Manager / Public Works - City of RPV
Lina Nguyen	GIS
Andy Bradford	GIS, PVNET
Andy Winje	RPV PW
Paul Christman	CDD / BES
Sai Kim	CDD / Plng.
Tracy Brown	City Manager
Reki Cutler	Planning - RHE
Matt Waters	Finance - RPV

Emergency Planning Consultants

Section 11: Plan Maintenance

The Plan Maintenance section of this document details the formal process that will ensure that the Plan remains an active and relevant document. The plan maintenance process includes a schedule for monitoring and evaluating the Plan semi-annually and producing a plan update every five years. This section describes how the Cities will integrate public participation throughout the plan maintenance process.

Monitoring and Implementing the Plan

Plan Adoption

Adoption of the Plan by the Cities' governing bodies was one of the prime requirements for approval of the original Plan. Once the Plan is completed and FEMA approval granted, the City Councils will be responsible for adopting the Plan. The governing body has the responsibility and authority to promote sound public policy regarding hazards. The local agency governing body will have the authority to periodically update the plan as it is revised to meet changes in the hazard risks and exposures in the Cities. The approved Plan will be significant in the future growth and development of the planning area.

Future amendments and updates will be the responsibility of the City Managers.

Convener

The City Managers will delegate the Hazard Mitigation Subcommittee Chairs as Conveners to facilitate the Subcommittee meetings, and will assign tasks such as updating and presenting the Plan to the City Managers. Plan implementation and evaluation will be a shared responsibility among all Subcommittee members. The City Managers will have authority to approve amendments and updates to the Plan but will need to agree with the other city on those changes. In the future, should either City decide to publish a Plan separately, that will be acceptable.

Hazard Mitigation Planning Subcommittees

The Hazard Mitigation Planning Subcommittees will be responsible for coordinating implementation of plan action items and undertaking the formal review process. The convener will assign representatives from City departments, divisions, and agencies, including, but not limited to, the current Subcommittee.

In order to make the Subcommittee as broad and useful as possible, the City Managers may choose to involve other relevant organizations and agencies in hazard mitigation. These additional appointments could include:

- ✓ A representative from the American Red Cross
- ✓ A representative from a county government emergency response agency
- ✓ A representative of Utilities and other Special Districts providing infrastructure services to the Cities

The Subcommittee will meet no less than semi-annually. Meeting dates will be scheduled once the final Subcommittee has been established. These meetings will provide an opportunity to discuss the progress of the action items and maintain the partnerships that are essential for the sustainability of the Plan.

Implementation through Existing Programs†*

The Cities addresses statewide planning goals and legislative requirements through their General Plans, Capital Improvement Plans (CIP), and City Building and Safety Codes. The Plan provides a series of recommendations - many of which are closely related to the goals and objectives of existing planning programs. The Cities will have the opportunity to implement recommended mitigation action items through existing programs and procedures.

General Plan Policies related to hazard mitigation have been included in this Plan update.

Both Cities Building and Safety Department is responsible for adhering to the State of California's Building and Safety Codes. In addition, the Hazard Mitigation Planning Subcommittees will work with other agencies at the state level to review, develop and ensure Building and Safety Codes are adequate to mitigate or present damage by hazards. This is to ensure that life-safety criteria are met for new construction.

Some of the goals and action items in the Plan may be achieved through activities recommended in the CIP. Various City departments develop the CIP and review it on an annual basis. Upon annual review of the CIP, the Planning Team will work with the City departments to identify areas that the Plan action items are consistent with CIP goals and integrate them where appropriate.

Within six months of formal adoption of the Plan, the recommendations listed above will be incorporated into the process of existing planning mechanisms at the City level. The meetings of the Subcommittees will provide an opportunity for members to report back on the progress made on the integration of mitigation planning elements into City planning documents and procedures.

* **ELEMENT A: PLANNING PROCESS | A4**
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))
† **ELEMENT C. MITIGATION STRATEGY | C6**
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))

Economic Analysis of Mitigation Projects

FEMA's approach to identify the costs and benefits associated with hazard mitigation strategies, measures, or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis.

Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later.

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating hazards can provide decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Given federal funding, the Planning Team will use a FEMA-approved benefit/cost analysis approach to identify and prioritize mitigation action items. For other projects and funding sources, the Planning Team will use other approaches to understand the costs and benefits of each action item and develop a prioritized list. For more information regarding economic analysis of mitigation action items, please see Appendix A: Benefit/Cost Analysis.

Evaluating and Updating the Plan*

Formal Review Process

Both Cities will create a Hazard Mitigation Planning Subcommittee that will be responsible for evaluating, monitoring, implementing, and updating their portions of the Plan.

The Plan will be evaluated on a semi-annual basis to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. The evaluation process includes a firm schedule and timeline, and identifies the agencies and organizations participating in plan evaluation. The Convener or designee will be responsible for contacting the Subcommittee members and organizing the meetings. Members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan.

The Subcommittee will review the goals and action items to determine their relevance to changing situations in the Cities, as well as changes in State or Federal policy, and to ensure they are addressing current and expected conditions. The Subcommittee will also review Section 3: Risk Assessment portion of the Plan to determine if this information should be updated or modified, given any new available data. The coordinating organizations responsible for the various action items will report on the status of their projects, the success of various implementation processes, difficulties encountered, success of coordination efforts, and which strategies should be revised.

The Convener will be responsible for including all of the Subcommittee members in implementing and updating the Plan. The members will meet at least twice to make appropriate changes to the Plan before submitting it to the City Manager. The Subcommittee will inform the

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*** ELEMENT A: PLANNING PROCESS | A6**

A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))

other City of the changes made to the Plan. The Subcommittee Chairs will also notify all holders of the Plan when changes have been made. Every five years the updated plan will be submitted to the State Hazard Mitigation Officer at the California Office of Emergency Services for review and the Federal Emergency Management Agency for approval. The City Managers are authorized to adopt future updates and amendments to the Plan.

*Continued Public Involvement**

The Cities are dedicated to involving the public directly in the continual review and updates to the Plan. Copies of the Plan will be catalogued and made available at City Hall and at all City operated public libraries. The existence and location of these copies will be publicized in City newsletters and on the City websites. The websites will also contain the Point of Contact information that appears in the Executive Summary of the Plan. The Points of Contact will be responsible for gathering and tracking comments and concerns. A public meeting will also be held after each evaluation or when deemed necessary by the Subcommittee. The meetings will provide the public a forum in which they can express their concerns, opinions, or ideas about the Plan.

The Public Information Officer will be responsible for using City resources to publicize the annual public meetings and maintain public involvement through the public access channel, web page, and newspapers as appropriate.

*** ELEMENT A: PLANNING PROCESS | A5**

A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))

PART IV: APPENDX

Appendix A: Benefit/Cost Analysis

Benefit/cost analysis is a key mechanism used by the California Office of Emergency Services, the Federal Emergency Management Agency, and other state and federal agencies in evaluating hazard mitigation projects, and is required by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended.

This appendix outlines several approaches for conducting economic analysis of hazard mitigation projects. It describes the importance of implementing mitigation activities, different approaches to economic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies. Information in this section is derived in part from: 1) The Interagency Hazards Mitigation Team, 2) State Mitigation Plan, 3) Federal Emergency Management Agency Publication 331, and 4) Report on Costs and Benefits of Hazard Mitigation.

This section is not intended to provide a comprehensive description of benefit/cost analysis, nor is it intended to provide the details of economic analysis methods that can be used to evaluate local projects. It is intended to: 1) raise benefit/cost analysis as an important issue, and 2) provide some background on how economic analysis can be used to evaluate mitigation projects.

Why Evaluate Mitigation Strategies?

Mitigation activities reduce the cost of disasters by minimizing property damage, injuries, and the potential for loss of life, and by reducing emergency response costs, which would otherwise be incurred.

Evaluating hazard mitigation provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Evaluating hazard mitigation provides decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects. Evaluating mitigation projects is a complex and difficult undertaking, which is influenced by many variables.

First, natural disasters affect all segments of the communities they strike, including individuals, businesses, and public services such as fire, police, utilities, and schools. Second, while some of the direct and indirect costs of disaster damages are measurable, some of the costs are non-financial and difficult to quantify in dollars. Third, many of the impacts of such events produce “ripple-effects” throughout the community, greatly increasing the disaster’s social and economic consequences.

While not easily accomplished, there is value, from a public policy perspective, in assessing the positive and negative impacts from mitigation activities, and obtaining an instructive benefit/cost comparison.

Otherwise, the decision to pursue or not pursue various mitigation options would not be based on an objective understanding of the net benefit or loss associated with these actions.

What are Some Economic Analysis Approaches for Mitigation Strategies?

The approaches used to identify the costs and benefits associated with hazard mitigation strategies, measures, or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis. The distinction between the two methods is the way in which the relative costs and benefits are measured. Additionally, there are varying approaches to assessing the value of mitigation for public sector and private sector activities.

Benefit/Cost Analysis

Benefit/cost analysis is used in hazards mitigation to show if the benefits to life and property protected through mitigation efforts exceed the cost of the mitigation activity. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster related damages later. Benefit/cost analysis is based on calculating the frequency and severity of a hazard, avoided future damages, and risk.

In benefit/cost analysis, all costs and benefits are evaluated in terms of dollars, and a net benefit/cost ratio is computed to determine whether a project should be implemented (i.e., if net benefits exceed net costs, the project is worth pursuing). A project must have a benefit/cost ratio greater than 1 in order to be funded.

Cost-Effectiveness Analysis

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. This type of analysis, however, does not necessarily measure costs and benefits in terms of dollars. Determining the economic feasibility of mitigating hazards can also be organized according to the perspective of those with an economic interest in the outcome. Hence, economic analysis approaches are covered for both public and private sectors as follows.

Investing in Public Sector Mitigation Activities

Evaluating mitigation strategies in the public sector is complicated because it involves estimating all of the economic benefits and costs regardless of who realizes them, and potentially to a large number of people and economic entities. Some benefits cannot be evaluated monetarily, but still affect the public in profound ways. Economists have developed methods to evaluate the economic feasibility of public decisions that involve a diverse set of beneficiaries and non-market benefits.

Investing in Private Sector Mitigation Activities

Private sector mitigation projects may occur on the basis of one of two approaches: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. A building or landowner, whether a private entity or a public agency, required to conform to a mandated standard may consider the following options:

1. Request cost sharing from public agencies
2. Dispose of the building or land either by sale or demolition
3. Change the designated use of the building or land and change the hazard mitigation compliance requirement
4. Evaluate the most feasible alternatives and initiate the most cost effective hazard mitigation alternative

The sale of a building or land triggers another set of concerns. For example, real estate disclosure laws can be developed which require sellers of real property to disclose known defects and deficiencies in the property, including earthquake weaknesses and hazards to prospective purchasers. Correcting deficiencies is expensive and time consuming, but their existence can prevent the sale of the building. Conditions of a sale regarding the deficiencies and the price of the building can be negotiated between a buyer and seller.

How Can an Economic Analysis be Conducted?

Benefit/cost analysis and cost-effectiveness analysis are important tools in evaluating whether or not to implement a mitigation activity. A framework for evaluating alternative mitigation activities is outlined below:

1. Identify the Alternatives: Alternatives for reducing risk from hazards includes structural projects to enhance disaster resistance, education and outreach, and acquisition or demolition of exposed properties, among others. Different mitigation project assists in minimizing risk to hazards, but do so at varying economic costs.

2. Calculate the Costs and Benefits: Choosing economic criteria is essential to systematically calculating costs and benefits of mitigation projects and selecting the most appropriate alternative. Potential economic criteria to evaluate alternatives include:

- ✓ **Determine the project cost.** This may include initial project development costs, and repair and operating costs of maintaining projects over time.
- ✓ **Estimate the benefits.** Projecting the benefits or cash flow resulting from a project can be difficult. Expected future returns from the mitigation effort depend on the correct specification of the risk and the effectiveness of the project, which may not be well known. Expected future costs depend on the physical durability and potential economic obsolescence of the investment. This is difficult to project. These considerations will also provide guidance in selecting an appropriate salvage value. Future tax structures and rates must be projected. Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.
- ✓ **Consider costs and benefits to society and the environment.** These are not easily measured, but are assessed through a variety of economic tools including existence value or contingent value theories. These theories provide quantitative data on the value people attribute to physical or social environments. Even without hard data, however, impact of structural projects to the physical environment or to society should be considered when implementing mitigation projects.

- ✓ **Determine the correct discount rate.** Determination of the discount rate can just be the risk-free cost of capital, but it may include the decision maker's time preference and also a risk premium. Including inflation should also be considered.

3. Analyze and Rank the Alternatives: Once costs and benefits have been quantified, economic analysis tools can rank the alternatives. Two methods for determining the best alternative given varying costs and benefits include net present value and internal rate of return.

- ✓ **Net present value.** Net present value is the value of the expected future returns of an investment minus the value of expected future cost expressed in today's dollars. If the net present value is greater than the project costs, the project is determined feasible for implementation. Selecting the discount rate, and identifying the present and future costs and benefits of the project calculates the net present value of projects.
- ✓ **Internal Rate of Return.** Using the internal rate of return method to evaluate mitigation projects provides the interest rate equivalent to the dollar returns expected from the project. Once the rate has been calculated, it is compared to rates earned by investing in alternative projects. Projects may be feasible to implement when the internal rate of return is greater than the total costs of the project.

Once the mitigation projects are ranked on the basis of economic criteria, decision-makers can consider other factors, such as risk; project effectiveness; and economic, environmental, and social returns in choosing the appropriate project for implementation.

How are Benefits of Mitigation Calculated?

Economic Returns of Hazard Mitigation

The estimation of economic returns, which accrue to building or land owner as a result of hazard mitigation, is difficult. Owners evaluating the economic feasibility of mitigation should consider reductions in physical damages and financial losses. A partial list follows:

- ✓ Building damages avoided
- ✓ Content damages avoided
- ✓ Inventory damages avoided
- ✓ Rental income losses avoided
- ✓ Relocation and disruption expenses avoided
- ✓ Proprietor's income losses avoided

These parameters are estimated using observed prices, costs, and engineering data. The difficult part is to correctly determine the effectiveness of the hazard mitigation project and the resulting reduction in damages and losses. Equally as difficult is assessing the probability that an event will occur. The damages and losses should only include those that will be borne by the owner. The salvage value of the investment are important in determining economic feasibility. Salvage value becomes more important as the time horizon of the owner declines. This is important because most businesses depreciate assets over a period of time.

Additional Costs from Hazards

Property owners should also assess changes in a broader set of factors that change as a result of a large natural disaster. These are usually termed "indirect" effects, but they have a very direct effect on the economic value of the owner's building or land. They are positive or negative, and include changes in the following:

- ✓ Commodity and resource prices
- ✓ Availability of resource supplies
- ✓ Commodity and resource demand changes
- ✓ Building and land values
- ✓ Capital availability and interest rates
- ✓ Availability of labor
- ✓ Economic structure
- ✓ Infrastructure
- ✓ Regional exports and imports
- ✓ Local, state, and national regulations and policies
- ✓ Insurance availability and rates

Changes in the resources and industries listed above are more difficult to estimate and require models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic impacts of changes in an economy. Decision makers should understand the total economic impacts of natural disasters in order to calculate the benefits of a mitigation activity. This suggests that understanding the local economy is an important first step in being able to understand the potential impacts of a disaster, and the benefits of mitigation activities.

Additional Considerations

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from hazards. Economic analysis saves time and resources from being spent on inappropriate or unfeasible projects. Several resources and models are listed on the following page that assist in conducting an economic analysis for hazard mitigation activities.

Benefit/cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. Many communities are looking towards developing multi-objective projects. With this in mind, opportunity rises to develop strategies that integrate hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development, among others. Incorporating hazard mitigation with other community projects can increase the viability of project implementation.

Resources

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